APR 21 1927

THE INDUSTRIAL-ARTS MAGAZINE

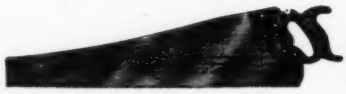
PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

MAY · 1927

THE BRUCE PUBLISHING COMPANY
MILWAUKEE · WISCONSIN

ATKINS SILVER STEEL SAWS

School Supervisors Save School Money by Specifying Silver Steel Saws, Saw Tools, Specialties, Grinding Wheels and Machine Knives.



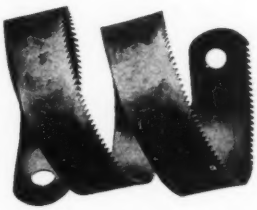
"THE 400" SHIP PATTERN
"The 400" is made of Silver Steel, Mirror Finish, Solid Rosewood handle Perfection Pattern, which prevents wrist strain.

Atkins Silver Steel Narrow Band Saws are recommended for better and accurate work. Made in widths of ⅛ to 1¼ inches. Try a pair.

ATKINS BLUE STAR KNIVES
Atkins Blue Star High Speed Steel Knives; the latest development in high grade machine knives. They have no equal for wearing and cutting qualities.

ATKINS No. 53 REGULAR PATTERN
A most popular Atkins saw, No. 53, Silver Steel blade, Damaskeen finish, handle of Applewood, Perfection Pattern, embossed. Each work bench should have a No. 53.

ATKINS SOLID TOOTH CIRCULAR SAWS
For your circular saw table Atkins Silver Steel Circular Saws cannot be beat. The results from using Atkins will prove absolutely that they are "The Finest On Earth."

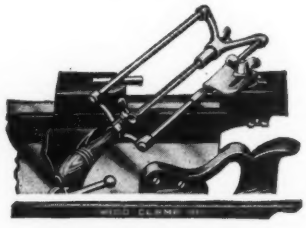


ATKINS NON-BREAKABLE BLADE
To those who have suffered a heavy loss on account of breakage the Atkins Non-Breakable Hack Saw Blade will prove extremely profitable.

ATKINS No. 3 NEST OF SAWS
Atkins No. 3 Nest of Saws is very popular in schools where high grade tools are appreciated. 12 inch keyhole blade. 14 inch Compass blade, 18 inch Metal Cutting blade, with interchangeable handle.

ATKINS No. 1 MITRE SAW
The fine quality of Atkins Silver Steel is also found in our Mitre Saws. 4 inches to 6 inches under back to tooth edge and in lengths of 18 inches to 32 inches. Genuine Applewood handle.

ATKINS GRINDING WHEELS
Acrolite Grinding Wheels for saws, knives and tools. Ferrolite Grinding Wheels for brass, copper, chilled iron, etc. Send for our Grinding Wheel book.



ATKINS HAND-SAW FILER
Every school should have at least one Atkins Hand Saw Filer. Easily operated by the youngest mechanic.

Ask for Atkins Text Book—tells how to care for and use Hand, Rip and Panel Saws.

Send for "Saws in the Shop," a book on metal cutting containing useful hints for the school workshop.

May we send Atkins' complete catalog descriptive of "A PERFECT SAW FOR EVERY PURPOSE"?

E. C. ATKINS & COMPANY

Established 1857 — ***The Silver Steel Saw People***

Machine Knife Factory: Lancaster, N. Y.

Home Office and Factory: INDIANAPOLIS, IND.

Canadian Factory: Hamilton, Ont.

Atlanta
New York
New Orleans
Minneapolis
Seattle
San Francisco
Portland
Memphis
Chicago
Vancouver, B. C.
Paris, France

THE INDUSTRIAL ARTS MAGAZINE

Volume XVI MAY, 1927 No. 5

SOME PROBLEMS OF THE GENERAL METAL SHOP

J. W. Bollinger, Tulsa, Oklahoma

The general metal shop is the latest acquisition in the field of manual-arts education. It is a multiactivity shop, or one in which a number of kinds of work are carried on at one time, as distinguished from the uniactivity shop, in which only one type of work is provided for. The idea of the general metal shop was taken into the schools from the industrial world, and is becoming increasingly more popular.

Observation shows that this type of shop is becoming increasingly more common in everyday industry. Thus, in many automobile service and repair stations, one frequently finds electrical work, forge work, welding, soldering, machine work, and the like, all done in one shop. In rural communities, one finds the customary blacksmith shop transformed or developed into an all-around metal shop, doing repair work on all manner of farm machinery and taking care of a variety of metal-working operations in one shop. Then there are, of course, the larger manufacturing establishments which do quite a variety of metal-working jobs under one roof.

Advantages of the Multiactivity Shop

A multiactivity shop has several advantages from the point of view of the school. Perhaps the most important of these is the possibility of presenting to pupils a larger variety of experiences than in the uniactivity shop, with a great saving in the amount of equipment needed. In a uniactivity shop, it is necessary to have sufficient equipment of one kind, so that each pupil can be engaged in the same kind of work at the same time; in a general shop, it is necessary to have but a fraction of this equipment, depending on how the classes are organized. The matter of shop organization will be discussed later.

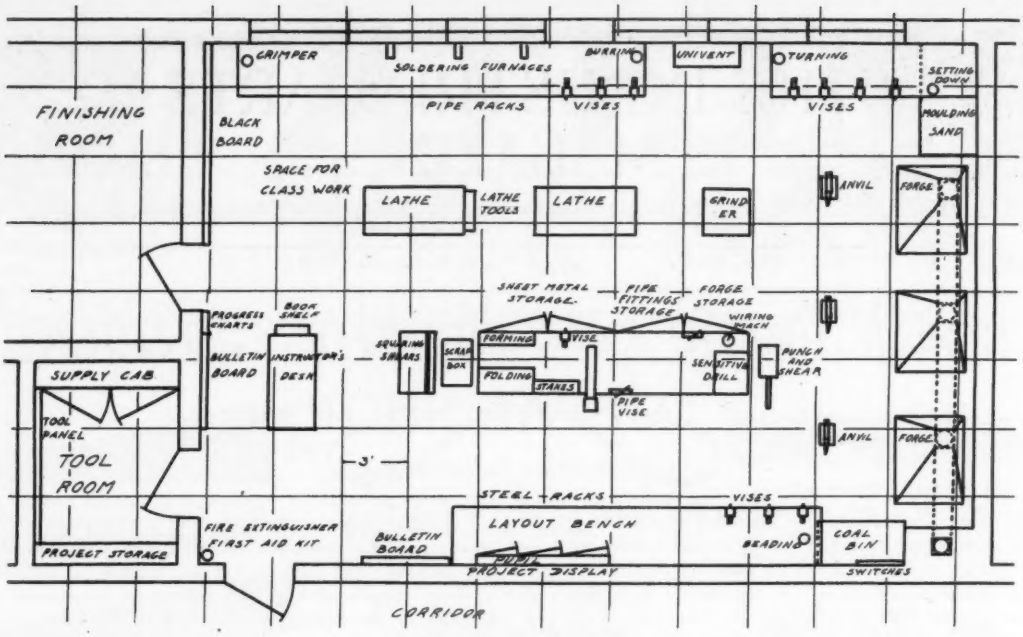
Still another advantage lies in the possibility for taking care of pupil differences, due to a wider range of choice, and a greater flexibility of organization. Just as soon as a pupil has gone as far as he wants to in one line of work, he can be readily shifted into another, in a manner to be described; in the uniactivity scheme of organization, he would have to wait until the general shifting took place, meanwhile succeeding in becoming a general nuisance, and accomplishing nothing. Or, should a pupil desire to investigate some particular field at greater length, the adaptability of the organization would permit this pupil to be readily taken care of. Then, too, having the various processes going on in the same room tends to greatly broaden the range of problems that could be undertaken, for there are numerous problems, which involve more than one kind of metal work, as a combination of forge work, lathe work, and pipe fitting, in the making of a floor lamp. To make this project in a uniactivity shop would offer some difficulty.

Several other advantages can be mentioned. For the smaller school system, and for the system with limited means, the general shop has its appeal, because it is possible to "expose" pupils to a greater variety of experiences than is possible in the customary woodwork and mechanical-drawing courses offered at present. A general metal shop opens up to pupils the enormous field of the metal-working industries. In the junior high school, such a shop is an admirable one in which to present "finding" or "tryout" courses with a maximum variety of experiences and with the added advantage of increased flexibility. The multiactivity shop is also adapted for handling variegated part-time or night-school classes. Here it serves admirably in solving some puzzling problems.

One of the great disadvantages of this type of organization is to find a teacher with sufficient breadth of experience to fill the job. However, teacher-training institutions are alert to the need, and are active in training such teachers. Stout Institute has a course for teachers of the general metal shop. Perhaps the wisest plan in selecting a man is to procure one qualified along several lines, then to put him into the shop to work out his own problems as best he can, and according to his ability. A man in this position would be a sort of "jack-of-all-trades"; he would not need to be a "master" of more than one or two of them. He could obtain considerable breadth of training by spending successive summers in different trades, thus keeping abreast of the times, and becoming better able to fill his job.

The Space Required for a Multiactivity Shop

Another problem is the size of the room needed to house such a shop. This will depend, of course, on what particular lines of work are to be included in the arrangements; the type and amount of equipment that will be used; and the number of pupils that are to be accommodated at one time. These are questions to be decided by each school according to its means, its community, and its idiosyncrasies. Herewith will be presented a layout and discussion of a general metal shop as found in a junior high school, not with the idea that it is *the* metal shop, or that it contains the *best* equipment, or the best selection of activities. It is presented here in order to show *one* method of performance; let the reader adapt, measure, or criticize according to his experience or situation. If this paper presents several good ideas and arouses some thought in the reader's mind, its purpose shall have been served. The room shown in the accompanying drawing is 23' x 34', which, though it might be considered rather small, has been found to satisfactorily house the activities and to conveniently accommodate a maximum of 24 pupils per class. One noticeable feature of the room is the compactness of the



LAYOUT OF GENERAL METAL SHOP.

arrangements. This is a point well worth considering. It is the writer's opinion that most shops are far too large for the work to be done in them. A trip through a Ford assembly plant, or other well-organized manufacturing plant, will bring conviction on this point. In a compactly arranged shop the instructor does not need to "walk his legs off" going from one part of the room to another. By the end of the day, the "mileage" put in by the instructor in the large shop is considerably greater than that put in by the instructor in the small shop. The effect of this on fatigue and teaching efficiency is evident. In addition, the saving in time effected makes it possible for the instructor to serve more pupils per period, or to give more time to each pupil. In large classes this frequently helps to solve the "traffic" problem. Still another point is that the teacher can see every part of his shop at all times, and can get from one part of it to another on short notice. There are no out-of-the-way corners to tempt mischief-makers. The instructor can keep his weather eye to windward, and see when and where his assistance is most needed.

Choice of Activities to be Included

The next point to be considered is the choosing of the particular activities to be included. Here again, each school will differ. It would be impossible, and perhaps even unwise, to attempt to make any recommendations. The activities chosen for the shop in the plan are: forge work, with some molding in aluminum; machine work, including work on a lathe, grinder, and sensitive drill; pipe fitting; sheet-metal work including some work with copper; and benchwork including some jobs in home mechanics. An effort was made to select several outstanding types of metal-working industries; four general metal shops in as many junior high schools here were equipped for the same activities. When a pupil has progressed through these activities, he has traced metal through many of the important steps of its manufacture and use. Thus, in connection with molding, it is possible to bring in how ore is mined; smelting in its different aspects; and cast iron as one form in which iron is used. As part of the forge work, some of the other forms of iron and steel can be discussed. Tempering and welding of iron and steel are of supreme interest here, and their importance and application in the manufacture of iron and steel products can be brought out. How metals can be machined to shape is developed through instruction on the lathe, grinder, and drill press; in this connection it is possible to show pictures and to discuss the types of metal-working machines in common use. Since metals are used in the form of pipe, sheets, and beams—structural steel—work using metal in these forms is appropriate for a metal-work course. The final step is to see in how many ways this knowledge may be applied in the home, as discovered in the home-mechanics work. If, then, in connection with the various courses, trips be taken to some of the manufacturing plants in the city; if these are followed up with material relating to some of the major uses of iron and steel in modern life, most certainly the pupils' outlook on life and its complications will be materially strengthened, and their chances for success increased.

The Layout of the Shop

We are now ready to view the layout of the shop. Undoubtedly a "centralized" arrangement is preferred; that is, the machines and supplies belonging to one activity are to be grouped together as much as possible. The advantages of this scheme are self-evident. These activities, then, are to be "centralized" with reference to the instructor's desk, or vice versa, the instructor's desk is to be strategically located with reference to as many activities as possible. The advantages of this scheme are also self-evident. How to do this in any certain room, however, is seldom a self-evident proposition; 'tis easier said than done.

The best way to study the layout of the shop shown is to begin at the instructor's desk. The desk is first of all near the door to the corridor; it is easy at all times to see who goes and who comes. At the right is the toolroom and its accessories; it can be reached with but a few steps.

Most of the tools are kept on a panel on the rear wall of the room; they are grouped as much as possible according to the line of work for which they are intended. This panel is painted gray. It has a background or picture of each tool painted in black to show where the tool belongs, so that it is easy to check up on any missing tools. A toolkeeper is used to check the tools, each boy taking his turn one period at a time. Along one wall is a system of boxes for storing unfinished projects from one period to the next. The box belonging to the class in session is put on one corner of the instructor's desk, where he can supervise the distribution of the projects to the proper pupils. Each pupil is given a num-

ber which is punched in an out-of-the-way corner on his piece of work, and serves as a positive means of identification. This system works well in this particular shop. On the wall opposite the project boxes is a cabinet, with a lock on it, for storing various miscellaneous supplies. On the inside of the doors to this cabinet is a special tool rack for storing special tools and equipment not used frequently, such as taps and dies, thread gauge, reserve supply of drills, and the like.

Directly in front of the instructor's desk is the sheet-metal equipment. First a squaring shears; then a 12′ bench with a forming machine, a bar-folding machine, some stakes and a stake plate, a vise, and a sensitive drill. Space is also provided for attaching the various hand machines, such as the wiring machine, crimper, etc., which when not in use are stored in out-of-the-way corners of the benches as indicated. Beyond this bench is the combination punch and shear. The lower part of this bench has been made into a storage cabinet. Tin plate and small pieces of sheet metals are kept in the storage space indicated. It is advisable to have such materials behind the doors of a cabinet ordinarily, where they will not detract from the tidy appearance of the shop. All sheet-metal equipment is on or near this bench. The soldering furnaces are on a bench near the window.

On the bench are also two pipe vises, for doing pipe fitting. Directly underneath these vises is the storage cabinet for keeping pipe fittings. These are systematically arranged in bins and carefully marked, as in common trade practice.

Three forges occupy most of the space along the rear wall. The hoods of these forges cover the forge completely, having only a door 15″ x 15″ for placing work on the forge. All smoke and gases go out through the flue; none of the smoke can escape and mar the walls or spoil the clean appearance of the room. Part of the rear space is given over to a small foundry kit for working with aluminum.

Beginning again at the instructor's desk, to the left are two 11″ x 4′-0″ South Bend quick-change-gear motor-driven engine lathes. Beyond this is a 12″ grinder, pedestal type. To the left is the door to the finishing room. Beyond this is the blackboard, with space in front for pupil assembly and blackboard discussion and demonstration. To the left along the wall with the windows is an 18′ workbench. On this are three soldering furnaces, equipped with six soldering coppers. Underneath this bench are the pipe racks mentioned. On the end of the bench are three machinist's vises. Beyond this bench is another bench 8′ long with more machinist's vises, for bench metal work and the like.

To the right of the instructor's desk along the wall is a 16′ bench, used largely for sheet-metal layout. Underneath this bench are racks for various kinds of bar steel used in bench metal work and in forge work. Between this bench and the wall are kept large sheets of iron, copper, galvanized iron, and the like.

Lastly, and of quite some importance, there are two bulletin boards in the room, each with a glass door, one on the wall behind the instructor's desk, and one on the wall to the right near the sheet metal layout bench. These bulletin boards are used for pinning up job sheets. These job sheets are a great help in lightening the teaching load, and are a large cog in the machinery of classroom management.

The following equipment is required for the multi-activity shop:

Equipment

1 30″ squaring shears.
1 30″ forming rolls.
1 30″ bar-folding machine.
1 Stake plate; 6 stakes: square, beakhorn, blowhorn, creasing, candle-mold, and hollow mandrel.
1 Combination punch-and-shear.
5 Hand machines; wiring, turning, burring, crimping, and setting down.
2 South Bend quick-change-gear, 11′x4″ engine lathes.
1 12″ dry grinder, pedestal type.
1 ⅛″ sensitive drill, motor-driven.
3 Buffalo portable-type forges.
3 100-lb. anvils, and anvil blocks.
11 Machinist's vises.
2 Pipe vises.
3 Soldering furnaces.
Hand tools, for each line.
Benches, lockers, racks, etc.

Herewith is presented a list of equipment, which has been found adequate for the work outlined. This equipment has been duplicated in the 4 general metal shops in Tulsa.

Forge work:

3 portable-type steel forges.
3 anvils, 100 lb., with blocks.
12 hammers, ball-peen, 16 oz.
3 hammers, ball-peen, 24 oz.
1 blacksmith's sledge, cross-peen, 6 lb.
1 blacksmith's sledge, double-faced, 10 lb.
2 set hammers, one 1″, one 2″.
1 flatter, 3″.
1 hot chisel, 1½″.
1 anvil chisel, hot.
1 cold chisel, 1½″.
1 anvil chisel, cold.
3 hardie, 2″ regular.
3 fullers, top, one each, 1″, ¾″, ½″.
3 fullers, bottom.
3 swages, top, ¼″, ⅜″, ½″.
3 swages, bottom.
1 ladle, 4″ bowl.
1 galvanized iron pail, 10 qt.
1 coal hod.
1 scoop shovel, No. 1.
2 blacksmith's tongs, straight lip, ⅜″
2 blacksmith's tongs, straight lip, ½″.
6 blacksmith's tongs, 2 ea.; bolt, ⅛″, ⅜″, ¾″.
2 blacksmith's tongs, band or clip.
2 blacksmith's tongs, pick up.
2 blacksmith's tongs, link.
3 pokers.
3 dippers.
2 sets molder's flasks.

Machine work:

2 South Bend motor-driven quick-change-gear engine lathes, size 11″ by 4′.
2 chucks, one independent, one universal.
1 drill chuck, taper-shank.
1 set lathe dogs, ¼″ to 1½″.
2 drill holders, Armstrong, No. 1, and one No. 2.
1 cutting-off tool.
1 knurling tool, medium.
1 micrometer, 2″ maximum measurement.
1 set taper-shank drills, ⅛″ to 1″, by eighths.
1 drill-grinding gauge, 59 degrees.
12 combination drill and countersink, ⅛″ by $\frac{3}{32}$″.
1 steady rest.
1 follower rest.
2 face plates.
1 inside boring-and-threading tool holder, Armstrong
1 thread gauge.
2 calipers, inside, 5″.
2 calipers, outside, 5″.
1 speed indicator.
1 set of screw plates, 2-56 to 14-20. Greenfield Tap and Die Co.
1 set of screw plates, ¼″ to ⅜″ U. S. S.; G. T. D.
1 set of screw plates, ¼″ to ⅜″, S. A. E.; G. T. D.
1 set twist drills, $\frac{1}{16}$″ to ½″, by sixty-fourths.
1 set numbered drills, 1 to 60.
1 machinist's square, combination, Starrett, 12″.
1 surface gauge.
1 top and drill gauge.
1 screw-pitch gauge.
1 sensitive drill, ⅛″, motor-driven, bench type.
1 drill-press vise, Skinner, 2½″.
1 dry-grinding machine, pedestal type, 2 wheels, 12″ by 1½″.

Sheet metal:

1 squaring shears, 30″.
1 forming roller, 30″.
1 bar-folding machine, 30″.
1 stake plate.
5 stakes, one each: beakhorn, blowhorn, needlecase, creasing, and conductor.
1 hollow-mandrel stake.
1 punch and shear.
1 burring machine.
1 turning machine.
1 wiring machine.
1 beading machine.
1 crimper and beader.
1 setting-down machine.
3 soldering furnaces.
6 soldering coppers, 2 lb.
9 tinner's snips, straight, 10″.
2 tinner's snips, curved.
12 scratch awls, 3½″.
7 rivet sets, Nos. 2-8.
1 wire gauge.
6 mallets, rawhide, 2″ diameter.
6 pliers, Kraeuter, combination.
6 pliers, Kraeuter, wire-cutting.
12 steel rules, 12″.
2 framing squares, 18″ x 24″.
2 framing squares, 12″ x 18″.
6 framing squares, 8″ x 12″.
1 trammel points, Stanley No. 4.
6 wing dividers, 6″.
1 wing dividers, 8″.
4 hand seaming tools, 2 each: ¼″; $\frac{3}{32}$″.
1 set hollow punches, ¼″ to 1¾″ diameter.
3 riveting hammers.
6 jeweler's saw frames.

Pipe fitting:

2 pipe vises, ⅛″ to 2½″, hinged.
2 pipe cutters, ½″ to 2½″, 2 rollers.
1 set pipe-cutting stock and dies, ¼″, ⅜″, ½″, ¾″ threads.
2 pipe reamers.
2 bit braces, 5″ swing.
1 conduit bender.
4 Stillson wrenches, 14″.
4 Stillson wrenches, 10″.
1 Stillson wrench, 8″.

Bench metal; general:

11 machinist's vises, 4″ hardened jaws.
2 cold chisels, 1″.
2 cold chisels, ⅜″.
2 cold chisels, ½″.
1 set steel figures, ⅛″.
1 set steel numbers, ⅛″.
2 monkey wrenches, 12″.
2 monkey wrenches, 10″.
6 center punches, ⅜″.
6 screw drivers, 5″.
6 screw drivers, 8″.
12 hack saws, adjustable.
2 oilers, ½ pt.
3 file cleaners.
6 saw files, slim taper, single cut, 6″.
12 mill files, smooth, 10″.
12 mill files, second cut, 10″.
6 bastard files, one safe edge, 10″.
1 set EZ-outs.
3 breast drills, Millers Falls, 18″.
4 mortise locks.
4 compression faucets.
1 lawn mower, used.
1 gas heater, used.
1 length garden hose.

Following are types of materials used in the general metal shop. These items are duplicated in the four such shops in Tulsa.

Forge, machine, and bench metal:

Cold rolled steel, 2″, 1½″, 1″, ¾″, ⅜″, ½″.
Drill rod, ⅜″, ¼″, $\frac{3}{32}$″, ⅛″.
Wrought iron, round, ¾″, ½″, ⅜″, $\frac{5}{16}$″, ¼″.
Wrought iron, square, ½″, ⅜″, ¼″.
Wrought iron, flat, ½″x½″, $\frac{5}{16}$″x¼″, ¼″x1″, $\frac{3}{16}$″x3″, ⅜″x1½″.
Angle iron, ¾″x¾″, 1″x1″.
Tool steel, square, ¾″x¾″, 1″x1″.
Tool steel, octagon, ¾″, ½″, ⅜″, $\frac{5}{16}$″, ¼″.
Aluminum, for castings.
Babbitt metal.
Rivets, bolts, machine screws.

Sheet metal:

IC tin plate, bright.
Galvanized iron, No. 26.
Black iron, No. 24.
Stovepipe iron.
Solder, muriatic acid.
Steel wool, emery paper.
Copper, $\frac{1}{16}$″ thick.
Asphaltum varnish; nitric acid.

Pipe fitting

Pipe, ¼″, ½″, ⅜″, ¼″.
Pipe fittings: couplings, reducers, ells, tees, nipples, caps.

(To be Concluded.)

ELECTRICAL INSTRUCTION WITH MINIMUM COST AND SPACE FOR THE JUNIOR HIGH SCHOOL

F. E. Tustison, Stout Institute, Menomonie, Wis.

The woodworking, metal working, printing, and electrical shops are the outstanding industrial-arts courses in the well-organized junior high school. The general shop such as the general woodwork, the general metal, or the home-mechanics shop is a combination planned to include the above with the exception of printing. Recently, I had the pleasure of a ten-day inspection trip observing the junior high schools in Illinois and Ohio. My observation at that time corroborates the statement regarding the above shops. It also places the prevalence in the order given, i. e., the woodworking shop predominates, while the electrical shop is the least common. Some of the larger cities show an exception to this. I believe the Chicago schools show that the electrical shop stands second, instead of at the foot of the list. I am wondering why, in so many instances, electricity is the newcomer to the curriculums, since there are so many splendid reasons for its introduction.

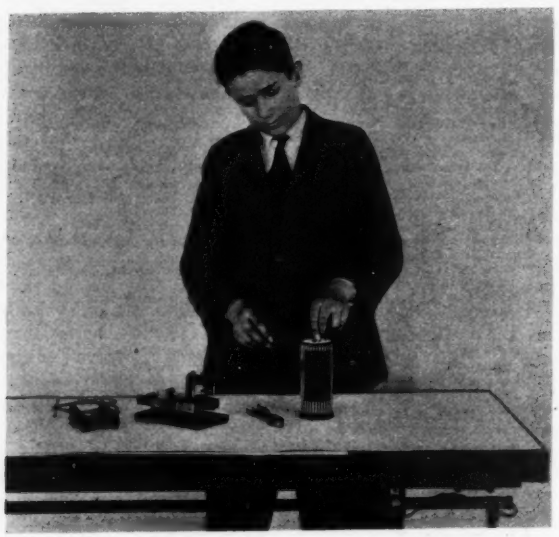


FIGURE 1. ELECTRICAL HOOK-UPS CAN BE ASSEMBLED AT THE WOODWORKING BENCH.

We are surely living in an electrical age. Electricity, which was little used until late, is now being harnessed to perform many operations. It supplies light, heat, and power, and its possibilities seem almost unlimited. Many of us can remember when the incandescent bulb was an experiment, while today it is an absolute necessity. Twenty-five years ago few houses were wired; twenty years ago, wiring for lights only, was ordinarily common; while in the last ten years the use of electrical appliances has doubled, trebled, and quadrupled. The amazing demand for electrical heat alone is illustrated by a survey of the appliances found in an up-to-date apartment house. The total number of electric stoves, grills, flatirons, toasters, and the like was 157. In addition to this each family had installed the many different varieties of dining table and toilet electrical appliances. Another survey of an apartment (which by the way furnishes vacuum-cleaner service, thus eliminating the need of individual cleaners) shows 42 flatirons, 38 electric stoves, 36 grills, 23 percolators, 18 toasters, besides a number of egg boilers, heat pads, heaters, hair curlers, ovens, waffle irons, and hot plates. These surveys are not extreme cases and illustrate the fast-increasing demand for electricity in heating appliances. In fact, the figures show that the heating load now is far greater than the lighting load. In addition to the heat load, power is also in demand and surveys similar to the above show numerous power appliances being installed in the home and the apartment. The washing machine, vacuum sweeper, sewing machine, refrigerator unit, vibrators, electrical fans, and electrical motors for general use are examples showing electricity used for power.

The Electric Shop Affords Many Contacts

The varied application of electricity affords more contacts for the boy than any other agency. The home, the school, and the factory all use electricity in one or more of its useful forms. It is said that there is no industry that does not come in direct or indirect contact with electrical energy. The study of electricity is as cultural and scientific as it is practical. It is the stepping stone to the sciences that are studied later in the curriculums. It will be of special help in the study of physics and chemistry. The boy who goes ahead with his schooling will thus find it valuable later on. The boy who drops from school will need all the more any knowledge gained while in the electrical shop.

These are some of the reasons why we think the electrical shop should be included in the industrial-arts course of the junior high school. The typical industrial-arts subject is that which every boy ought to study and know. On every side, and in every walk of life, we come in contact with the application of electricity. The radio, the automobile, the flashlight, the telegraph, the telephone, and light, power, and much of our heat are dependent upon it. Its usefulness, practicality, points of contact, and educational value appear to be unsurpassed by any of the sister courses.

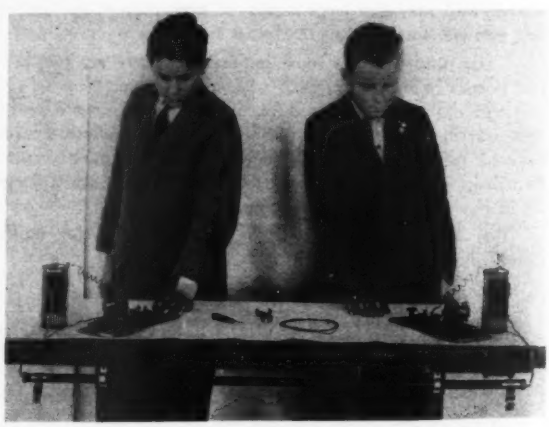


FIGURE 2. SMALL ADDITIONS TO A WOODWORKING BENCH AID IN ELECTRICAL INSTRUCTION.

One objection and drawback to the introduction of the electrical shop has been the cost of installation and the maintenance of that shop. It is thought by many that a separate shop especially equipped is necessary for the instruction. The numerous electrical supplies and pieces of apparatus are quite expensive and, being quite fragile, replacement is necessary at regular intervals. The economical director and superintendent has heeded the above so possibly the average school does not possess the necessary facilities for giving the boys training in the electrical shop. The city of Chicago says to its taxpayers, "We must do one of two things: reduce the shop instruction the boy is getting, or raise the taxes." Whatever that city's answer will be, it appears that any reduction in the cost of shop instruction will help the dilemma. If we can reduce the cost of instruction to a minimum, it may be the means of installing the necessary equipment to take care of this instruction.

Separate Electrical Shop Unnecessary

For the average junior high school a separate electrical shop is not available, neither is it necessary. The woodworking, home-mechanics, general metal, or general woodworking shops can be used to advantage to supply this demand.

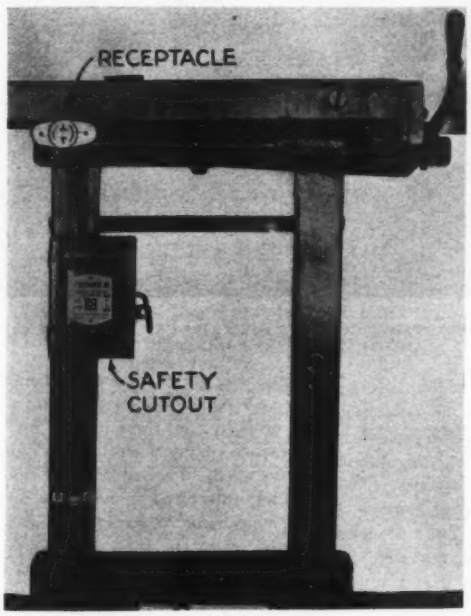


FIGURE 3. WOODWORKING BENCH EQUIPPED WITH FLUSH RECEPTACLE AND SAFETY CUTOUT.

Standard woodworking benches can be used for electrical instruction, also the regular table equipment that is found in the general metal or general woodworking shop will suffice. Many electrical hook-ups can be assembled at the woodworking bench. Figure 1 shows a boy learning something about motors at a regular woodworking bench. In fact, in a well regulated course over fifty per cent of the electrical shopwork needs only space on a bench or table. Small additions to the woodworking bench or table, however, will facilitate the electrical instruction. A piece of conduit attached underneath will be of service for telegraph hook-ups. Two boys may set up their instruments at the ends of the bench and use two wires through the conduit for their connecting lines. A ground connection at each end of the conduit allows the single wire circuit to be hooked up and demonstrated. Fig. 2 shows a telegraph circuit in operation at a regular woodworking bench.

Current supply can be provided at the regular bench and this need not interfere in any way with other instruction that

FIGURE 4. WIRING PROBLEMS CAN BE MOUNTED ON PANELS AT A BENCH OR TABLE.

is carried on. A regular receptacle of the flush or screw type may be attached below or at the back of the bench. The receptacle should be mounted in a metal outlet box and the service supplied in conduit. This gives a neat and more permanent installation. A safety cutout, or entrance switch, between the service and the receptacle is recommended. This safeguards each bench separately and makes it dependent upon the fuses inserted. Figure 3 shows such an installation. The flush receptacle allows quick connection with an attachment cord. This is one of many similar arrangements that will supply the individual woodworking bench with current. Such an outlet will serve extension cords, attachment cords, and heating elements of all kinds. It will also supply current to panel-mounted wiring hook-ups that use a flexible cord to obtain a temporary test connection. A drop cord similar to the one that supplies light from above, may also be used to supply current for the job. This is only recommended as a last resort where the current supply cannot be obtained from below.

Auxiliary Panels Useful for Wiring Problems

Numerous auxiliary panels have been devised to be used in connection with the woodworking or other bench for the installation of wiring problems. These are planned to take care of the numerous bell hook-ups, and in some cases a framework of 2 by 4's allows knob and tubework. These are often held upright in the vise and braced to the back of the bench. I have found the plain panel to be very satisfactory. Several of these are easily stored at each bench and they will accommodate all hook-ups exclusive of knob and tubework. Such a panel 20"x36" is large enough for the average problem. Panels because of their plain construction are as easily stored as drawing boards where an extra supply becomes

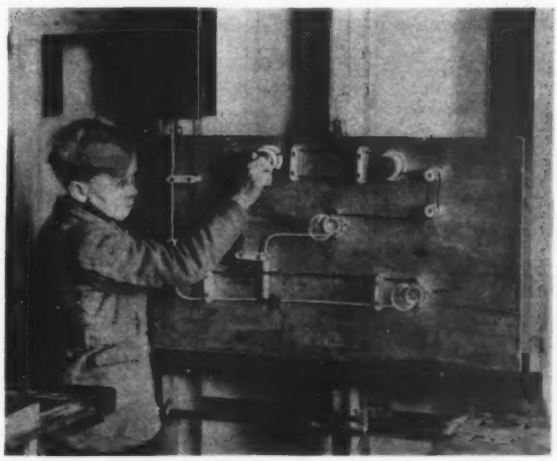


FIGURE 5. STUDENT TESTING A THREE-WAY CIRCUIT AT A TEST WALL.

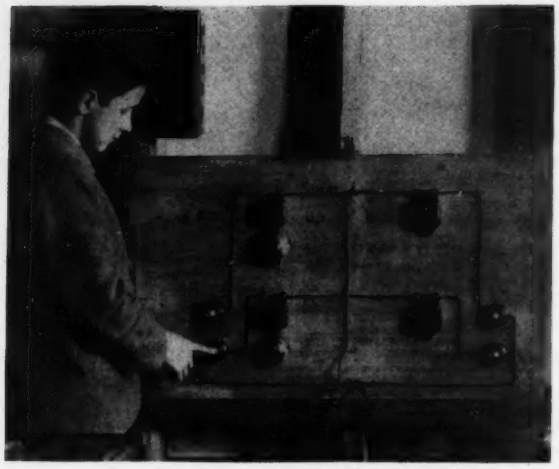


FIGURE 6. TESTING A BELL CIRCUIT AT A TEST WALL (A 6-VOLT A. C. OUTLET SUPPLIES THE CURRENT FROM BELOW).

necessary. Because of their light weight they are easily handled. Such a panel allows most of the work to be done at the student's bench or table. Figure 4 shows a boy mounting an open-wiring problem on a plain panel. Bell circuits and even conduit hook-ups can be mounted likewise. If current is not available at the individual bench, the panel is carried to a general test outlet in a test wall. Figure 5 shows the boy testing his three-way circuit at such a wall. When the hook-up is completed at the bench, it is carried to the wall for testing. The hook-up is supplied with current, when the two leads are connected to the cutout in the cabinet box shown. Figures 6 and 7 show a bell circuit and conduit hook-up being tested at such a test space. The author has found such a test wall more satisfactory than supplying the individual bench with current. However, a combination of the two will not come amiss.

The Test or Practice Wall a Useful Adjunct

The test or practice wall, while not absolutely necessary, will add much to the success of the course. Such a wall requires a minimum amount of floor space. Where natural wall space is available this can be installed around the room. Booths are convenient for very individual work, but they necessitate more floor space than is available in the shop already equipped with benches. In a new installation, with plenty of floor space available, the booth arrangement is very satisfactory. In the home-mechanics shop at the Stout Institute a single wall eighteen feet long built out of 2 by 6's does the work for a class of twenty and more boys. It occupies the aisle in the center of the room and accommodates the pupils on either side. There is a clearance of 15" from the wall to the benches. This distance is not quite sufficient and a 30" working space would be more satisfactory. However, it shows what can be done in minimum space. The studding

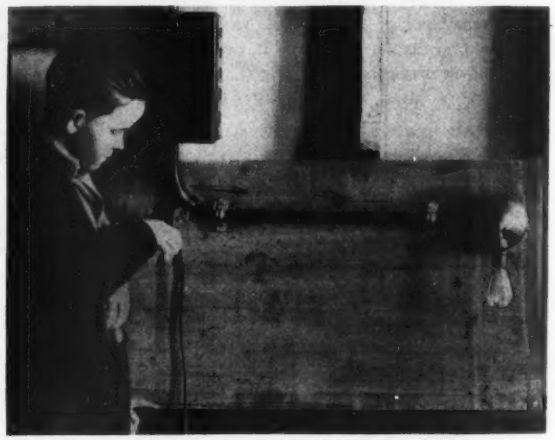


FIGURE 7. SIMPLE CONDUIT HOOK-UPS CAN BE PANEL MOUNTED AND TESTED AT THE GENERAL TEST WALL.

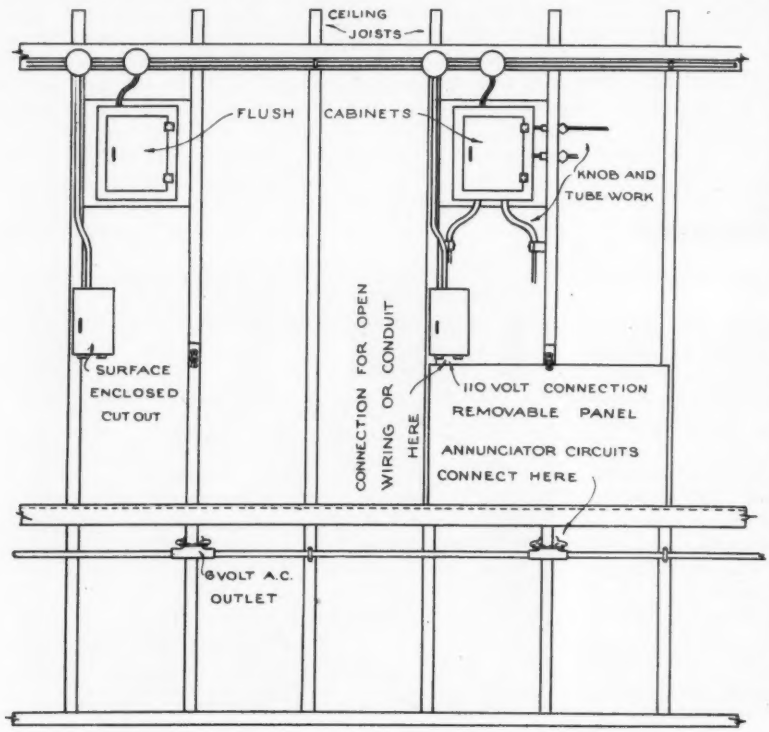

CEILING JOISTS
FLUSH CABINETS
KNOB AND TUBE WORK
SURFACE ENCLOSED CUT OUT
CONNECTION FOR OPEN WIRING OR CONDUIT HERE
110 VOLT CONNECTION REMOVABLE PANEL
ANNUNCIATOR CIRCUITS CONNECT HERE
6 VOLT A.C. OUTLET

FIGURE 8. LAYOUT FOR AN ASSEMBLY WALL FOR ELECTRICAL WORK.

of the wall are average-room height and 2 by 6's nailed horizontally and extending on both sides three or four feet make a practice ceiling where ceiling lights can be installed. The addition of this wall has not interfered in any way with the home-mechanics instruction that is still carried on in the shop and it accommodates an additional eighteen-weeks' course in electricity for the eighth-grade boy. Figure 8 shows a section of this wall.

One-hundred-ten-volt electrical outlets supplied at regular intervals along the wall will be convenient. These can consist of entrance switches mounted in metal cutout boxes, or better, cutouts of the safety type. An outlet for every two studding panels, will furnish a working or test space for one student, which is the minimum requirement. If space between three or more studding panels is available, it will be more satisfactory for knob and tube-work. This is only recommended where plenty of space is available. A trough similar to a chalk rail makes a satisfactory temporary support for panels that are brought in for a test current. A metal or wood button will hold the panel at the top. The advantage of this arrangement should be evident. The test wall is not large enough to accommodate all the class at one time.

The wiring jobs are mounted on panels at the student's bench or table. While he is doing this, the test spaces are available for others. Figure 8 (left half) shows a blank test and working space. A mounting board is shown inserted on the right. The 110-volt cutout is inclosed in the cabinet at the upper left-hand corner of each working space.

Instructors will find Fahnestock spring binding posts useful in protecting connections that are used over and over again. Students lose set screws or strip the threads after a time. Spring posts attached to the cutouts allow ready connection for each test. Should the spring post become defective it is easily replaced. Figure 9 shows the Fahnestock post in use on a special low voltage A.C. outlet. This same type is used on entrance cutout switches with success.

The current usually available is 110-volt A.C. This can be supplied directly to the wall or bench from the city mains. Direct current will be found convenient if it can be secured. It is useful in storage-battery work and direct-current instruments are cheaper than those for alternating current. If both alternating current and direct current are available, they can be supplied to the outlets by a double-throw double-pole switch. This will supply either alternating current or direct current as desired at the test wall.

A low-voltage alternating-current circuit for bell hook-ups will reduce the use of dry cells. Dry cells are expensive and the eighth-grade boys use them hard. Some dry-cell hook-ups are necessary, but these can be used where transformed alternating current will not suffice. A bell-ringing transformer will supply the desired low-voltage alternating current. Outlets can be attached below the mounting-board rack so that the bell hook-ups can be quickly connected. Fahnestock posts will provide a quick connection here also. A serviceable low-voltage outlet can be made from a type C condulet, a cover of ¼" fibre, and two spring binding posts. See Figure 9 which is a drawing of same. This outlet allows a "quick test" for any bell circuit that is panel mounted. Figure 6 shows a boy testing a bell circuit at a test panel supplied with "quick-test" low-voltage alternating-current outlet.

Some flush cutout cabinets mounted on the wall afford convenient connection for knob and tubework circuits. The branch circuits are then connected to the cutouts as in a regular installation. The 2 by 6's will accommodate two sets of exercises, one on either side. Care should be exercised in boring the first holes for the tubes. Each succeeding pupil can then use the same holes. It is not possible to allow each boy to bore the holes and keep the cost to the minimum. You may say this is not practical. I will admit it is more practical for the boy to bore the hole but I am also satisfied to omit this operation in order to supply the necessary electrical information that the rest of the job will give. The flush cabinets are shown at the top of the test wall in Figure 8. These cabinets are 10" x 12" and contain two cutouts. This allows two circuits in knob and tube wiring. Baseboard receptacles, wall brackets, switches and ceiling outlets can be installed in circuits fed from these cabinets.

By installing the electrical instruction in the woodworking, home-mechanics, or similar shop, the duplication of tools will be eliminated. This is especially true if the work is given in the home-mechanics shop which is partially equipped to take care of some electrical instruction. It is possible to reduce the duplication of pliers, screw drivers, vises, furnaces, soldering coppers, and the like. Several hundred dollars will go a long way toward additional tools and equipment for an electrical course.

The Content of the Electrical Course

I believe a few words concerning the content of such a course will prove of advantage. I feel that such a course should be based upon the fundamentals of electrical wiring and of electrical science. The electrical shop should furnish the junior-high-school boy not only useful knowledge in mechanical electricity but also start him in the science and theory of it. We are following out this theory at Stout Institute and have experienced good results.

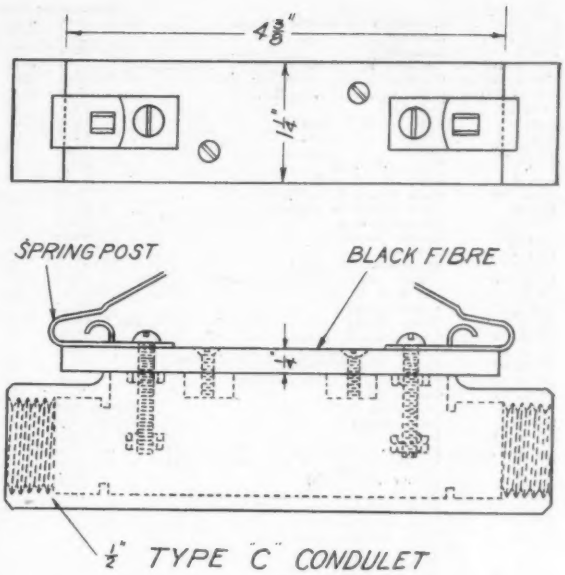


FIGURE 9.

Quantity and Cost of Tools and Supplies

The following is a list of extra tools and supplies that can be added to a woodworking or metal-working shop for additional instruction in electricity. The content is determined by courses which the author has worked out for practice classes at Stout Institute. The equipment and supplies can be varied somewhat to suit individual ideas in the subject. The list is suitable for a class of twenty boys. The first quantity is the amount necessary under average conditions, but rotation of jobs may be practiced. The second quantity will be necessary where not so much rotation is used and where a good supply of tools and supplies will not come amiss. The cost of the minimum list is about $300, the maximum being double that amount. The actual supplies consumed by each class of twenty are about twenty per cent of the minimum outlay making the cost per capita about three dollars per semester of work. Careful supervision of supplies, however, will be necessary to maintain the above. This can be increased or decreased depending upon the care exercised in the hook-ups and the selection of the jobs. The following list gives the quantity and cost of tools and supplies required for twenty boys in electricity:

Quantity	Article		Approximate Cost
10 sq. ft.	Asbestos slate, ⅛"	Per sq. ft.	$ .15
1 to 2	Annunciators	Each	4.00
10 to 20	Attachment pieces (flat iron)	Each	.30
2-4	Ammeters (pocket) D.C., O-35	Each	.75
1-2	Ammeters, D.C. or A.C., O-10	Each	20.00
10-20	Battery Clips	Each	.18
2 lb.	Borax (Mule Team)	Per lb.	.12
10 to 20	Battery Jars	Each	.75
10 to 20	Bells	Each	.40
10 to 20	Buzzers	Each	.40
10 ft.	Brass Rod, ¼" (round)	Per ft.	.05
5 to 10	Boxes, sectional, 2¼"x3"x2"	Each	.085
5 to 10	Boxes, wall outlet, 3¼"x1½" (round)	Each	.07
5 to 10	Boxes, ceiling outlet, 3¼"x¾" (round)	Each	.07
10 to 20	Boxes, conduit, 4"x1½" (octagon or round)	Each	.15
5 to 10	Boxes, 6x10x4, for entrance cutouts	Each	.65
5 to 10	Box covers (lamp cord), 4"	Each	.04
5 to 10	Box covers (sign receptacles), 4"	Each	.035
10 to 20	Box covers (surface devices), 4"	Each	.035
50 to 100	Bushings, ½" conduit	Per hundred	1.60
25 to 50	Bushings (porcelain) for ½" knockouts	Each	.04
100	Bushings, ⅛" socket	Per hundred	.40
5 to 10	Brackets (side wall)	Each	.88
5 lb.	Chromic acid (coml. for batteries)	Per lb.	.50
50 pr.	Cleats (two wire)	Per hundred	1.25
5 to 10	Condulets, ½" L.R.	Each	.38
5 to 10	Condulets, ½" L.L.	Each	.38
5 to 10	Condulets, ½" C	Each	.35
5 to 10	Condulets, ½" H	Each	.40

Quantity	Article	Approximate Cost
25 to 50	Connectors for flexible conduit	Per hundred 4.00
10 to 20	Couplings, ½"	Each .07
2 to 4	Compasses	Each .50
50 to 100 ft.	Conduit, ½" (black or galv.)	Per hundred, $7.10 to 8.40
100 to 200 ft.	Conduit (flexible loom) for No. 14	Per hundred 1.80
100 to 200 ft.	Cable (armored) type B.X	Per hundred 6.00
10 to 20	Dry Cells	Each .30
2 to 4	Dies, 13/16" x 12-24	Each .40
2 to 4	Dies, 13/16" x 6-32	Each .40
10 to 20	Elbows (½" conduit)	Each .13
4 to 8	Files, 10" mill	Each .20
4 to 8	Files, 10" bastard	Each .24
25 to 50	Fuses (H. & L. refillable)	Each .20
3 to 6	Fuses (cartridge refillable)	Each .48
10 to 20	Ground clamps	Each .15
5 to 10	Guards (lamp)	Each .25
1 to 2	Hack saws	Each 1.00
1 to 2	Hydrometer (battery)	Each .80
10 to 20	Hickies (to fit fixtures and stud)	Each .04
10 ft.	Iron Rod, ¼" dia	Per ft. .02
6 to 12	Knives (pocket)	Each .50
50 to 100	Knobs (split)	Per hundred 1.20
10 to 20	Lamps, 1½-V. Battery	Each .12
10 to 20	Lamps, 3-V. Battery	Each .12
20 to 40	Lamps, 120-W. Carbon	Each .30
20 to 40	Lamps, 14-V. Christmas Tree	Each .09
5 to 10	Lamps, 28 V.	Each .25
100	Lock nuts, ½"	Per hundred .70
100	Loom clamps	Per hundred .60
10 to 20	Lugs	Per hundred 1.25
1 gross	Machine screws, brass, ¼" R. H., 6-32	Per gross .30
1 gross	Machine screws, ⅛" brass, R. H., 4-40	Per gross .20
2 to 4	Motors (St. Louis)	Each 3.00
2 to 4	Magnets (electro for motor)	Each 1.10
1 gross	Nuts, hexagon, brass, 4-40	Per gross .50
1 gross	Nuts, hexagon, brass, 12-24	Per gross 1.00
1 gross	Nuts, hexagon, brass, 6-32	Per gross .40
6 to 12	Pliers	Each .60
2 to 4	Portable clusters	Each .40
10 to 20	Plugs (swivel)	Each .12
10 to 20	Plugs (separable)	Each .07
20 to 40	Push buttons	Each .08
10 to 20	Poles (battery) copper	Each .05
10 to 20	Poles (battery) lead	Each .07
10 to 20	Poles (battery) carbon	Each .10
10 to 20	Poles (battery) zinc	Each .05
10 to 20	Poles (battery) aluminum	Each .10
50 to 100	Plugs, K. O., ½"	Per hundred 2.50
1 lb.	Rosin	Per pound .09
1 to 2	Rectifiers (tungar 2-5 amps.)	Each, $15.00 to 20.00
5 to 10	Receptacles (for conduit bodies)	Each .25
10 to 20	Receptacles (cleat) medium base	Each .09
20 to 40	Receptacles (cleat) miniature	Each .07
10 to 20	Receptacles (sign)	Each .13
10 to 20	Receptacles (flush) and plates	Each .25
10 to 20	Receptacles (duplex) and plates	Each .35
1 to 2	Reamer (burring)	Each .90
5 to 10 lbs.	Solder	Per lb. $0.30 to .45
4 to 8	Soldering coppers, 2 lb., pair	Per pair .60
2 to 4	Soldering furnaces	Each 6.00
10 to 20	Soldering paste, 2-oz. tins	Each .10
5 to 10	Salammoniac, ½-lb. cakes	Each .40
6 to 12	Screw drivers, 5"	Each .30
6 to 12	Screw drivers, 2½"	Each .25
1 to 2	Stocks (Armstrong for ½")	Each 5.00
1000	Staples, insulated No. 1	Per M 2.00
10 to 20	Sockets (key)	Each .22
1 to 2	Storage batteries, 10 Amp. Hr.	Each 4.50
10 to 20	Studs (fixture) to fit hickies	Each .05
9 lb.	Sulphuric acid (1 bottle)	Per bottle 2.00
5 to 10	Switches (single pole) surface	Each .22
10 to 20	Switches (3-way) surface	Each .42
2 to 4	Switches, (4-point) surface	Each .76
10 to 20	Switches (feed through)	Each .35
5 to 10	Switches, entrance cutout	Each .45
5 to 10	Switches (flush) single-pole and plates	Each .25
5 to 10	Switches (flush) three-way and plates	Each .32
5 to 10	Switches (safety) to substitute for cabinet box	Each 1.00
10 to 20	Switch bases (porcelain)	Each .05
1 gross	Screws, ¾" x 5 F.H.	Gross .15
1 gross	Screws, 2" x 8 R.H.	Gross .35
1 gross	Screws, 1" x 6 R.H.	Gross .22
1 gross	Screws, 2½" x 8 F.H.	Gross .30
1 gross	Screws, ¾" x 8 R.H.	Gross .22
2 to 4 lb.	Tape (friction)	Per lb. .35
1 to 2 lb.	Tape (rubber)	Per lb. .35
2 to 4	Telegraph keys	Each 2.00
2 to 4	Telegraph sounders	Each 2.50
2 to 4	Telegraph relays	Each 4.25
2 to 4	Transformers, 25-W	Each 1.15
2 to 4	Transformers, 125-W	Each 9.00
50 to 100	Tubes, 3" x ⅞" (porcelain)	Per M 6.40
2 to 4	Thread (carpet black)	Per spool .10
2 to 4	Volt meters (pocket) O-16 volts	Each 1.50
1 to 2	Volt meters, A.C. or D.C., O-150	Each, $10.00 to 30.00
2 to 4	Vises (combination)	Each, 4.00 to 9.00
10 to 20	Wall plate, 1¼" base, ⅛" thread	Each .06
500 to 100 ft.	Wire, No. 14, rubber-covered, white and black braid	Per M 8.00
250 to 500 ft.	Wire, No. 18 fixture	Per M 4.72
50 to 100 ft.	Wire, No. 6, rubber-covered	Per hundred 3.50
100 to 200 ft.	Wire, heater cord, No. 16	Per hundred 2.40
100 to 200 ft.	Wire, lamp cord, No. 18	Per hundred 1.40
10 lb.	Wire, annunciator, No. 18	Per lb. .37
4 lb.	Wire, magnet, D. C. C. No. 32	Per lb. 1.89
2 to 4 lb.	Wire, magnet, D. C. C. No. 34	Per lb. .75
2 to 4 lb.	Wire, magnet, D. C. C. No. 30	Per lb. 1.50
1 lb.	Wire, Comet (Driver-Harris Co., Chicago, Ill.) (No. 28)	Per lb. 2.24
1 lb.	Wire, Comet, No. 22	Per lb. 1.50
1 lb.	Wire, fuse, 1 amp	Per lb. 1.60
1 lb.	Wire, fuse, 10 amp	Per lb. .80
50 to 100 ft.	Wire, rubber covered, No. 10	Per M 16.50
2 to 4	Wrenches (Stillson) 8"	Each .70

Asbestos slate can be purchased from the Johns-Manville, Inc., Chicago, Ill.

SUGGESTIVE PRINTING EQUIPMENT FOR JUNIOR-SENIOR HIGH SCHOOLS

C. W. Hague, Head of Printing Department, The Stout Institute, Menomonie, Wis.

The following lists of printing equipment for junior and senior high schools has been compiled for the purpose of aiding and guiding directors and school boards in selecting equipment for their schools. It is in no sense perfect, or final, and it is assumed that it will be revised and molded to fit the particular conditions to be met. It is simply suggestive and will generally indicate the scope of equipment, together with approximate costs, needed for the installation of a printing department.

This equipment has been compiled under two classes: Class B, representing the minimum which may be installed for efficient instruction, and class A, approaching the ideal equipment for a larger school. It is expected that if a school starts with the equipment in class B, it will gradually make additions leading toward the larger and more complete classification.

The prices listed here are tabulated by the American Type Founders Co., and while they are substantially correct at the present writing, they are continually subject to change and fluctuation, and it is advised that current prices be obtained before purchase is authorized. From these lists it may be seen that the minimum expenditure for a complete equipment, intended to accommodate about ten students, will be in the neighborhood of $2,000. This equipment will also facilitate the printing of common school forms and small publications.

The American Type Founders Co., of Jersey City, N. J., and Barnhart Bros. & Spindler, of Chicago, maintain educational departments for the purpose of aiding prospective purchasers in the selection and installing of equipment, and they stand ready at all times to give their aid to schools. The writer is also glad at any time to act in an advisory capacity to individuals contemplating the installation of such equipment.

EQUIPMENT FOR CLASS A OUTFIT[1]

Body Type

	Amount	Cost per lb. or font	Total Cost
6-point Century Oldstyle	20 lbs.	$ 1.50	$ 30.00
8-point Century Oldstyle	100 lbs.	1.27	127.00
10-point Century Oldstyle	200 lbs.	1.27	218.00
12-point Century Oldstyle	20 lbs.	1.10	22.00
14-point Century Oldstyle	3 fonts	5.00	15.00
18-point Century Oldstyle	3 fonts	5.40	16.20
24-point Century Oldstyle	3 fonts	5.80	17.40

Job Type

6-point Cheltenham Bold	3 fonts	3.40	10.20
8-point Cheltenham Bold	3 fonts	3.80	11.40
10-point Cheltenham Bold	4 fonts	4.20	16.80
12-point Cheltenham Bold	4 fonts	4.60	18.40
14-point Cheltenham Bold	4 fonts	5.00	20.00
18-point Cheltenham Bold	20 lbs.	1.00	20.00
24-point Cheltenham Bold	20 lbs.	.94	18.80
30-point Cheltenham Bold	25 lbs.	.88	22.00
36-point Cheltenham Bold	2 fonts	8.00	16.00
48-point Cheltenham Bold	1 font	11.60	11.60
60-point Cheltenham Bold	1 font	14.45	14.45

[1]The List for Class B will be printed in the Industrial-Arts Magazine for July, 1927.

Job Type

	Amount	Cost per lb. or font	Total Cost
72-point Cheltenham Bold	1 font	17.10	17.10
6-point Century Oldstyle Bold	3 fonts	3.40	10.20
8-point Century Oldstyle Bold	4 fonts	3.80	11.40
10-point Century Oldstyle Bold	4 fonts	4.20	16.80
12-point Century Oldstyle Bold	4 fonts	4.60	18.40
14-point Century Oldstyle Bold	3 fonts	5.00	15.00
18-point Century Oldstyle Bold	3 fonts	5.40	16.20
24-point Century Oldstyle Bold	3 fonts	5.80	17.40
30-point Century Oldstyle Bold	2 fonts	7.25	14.50
36-point Century Oldstyle Bold	1 font	8.35	8.35
42-point Century Oldstyle Bold	1 font	10.85	10.85
48-point Century Oldstyle Bold	1 font	12.10	12.10
60-point Century Oldstyle Bold	1 font	15.15	15.15
10-point Century Oldstyle Bold Condensed	3 fonts	4.20	12.60
12-point Century Oldstyle Bold Condensed	3 fonts	4.60	13.80
14-point Century Oldstyle Bold Condensed	3 fonts	5.00	15.00
18-point Century Oldstyle Bold Condensed	3 fonts	5.40	16.20
24-point Century Oldstyle Bold Condensed	2 fonts	5.80	11.60
30-point Century Oldstyle Bold Condensed	2 fonts	6.65	13.30
36-point Century Oldstyle Bold Condensed	1 font	6.95	6.95
8-point Century Oldstyle Bold Italic	3 fonts	3.80	11.40
10-point Century Oldstyle Bold Italic	4 fonts	4.20	16.80
12-point Century Oldstyle Bold Italic	3 fonts	4.60	13.80
14-point Century Oldstyle Bold Italic	2 fonts	5.00	10.00
18-point Century Oldstyle Bold Italic	2 fonts	5.40	10.80
24-point Century Oldstyle Bold Italic	2 fonts	4.20	16.80
8-point Century Oldstyle Italic	3 fonts	3.80	11.40
10-point Century Oldstyle Italic	4 fonts	4.20	16.80
12-point Century Oldstyle Italic	3 fonts	4.60	13.80
14-point Century Oldstyle Italic	3 fonts	5.00	15.00
18-point Century Oldstyle Italic	3 fonts	5.40	16.20
6-point Heavy Copperplate Gothic No. 21	3 fonts	1.70	5.10
6-point Heavy Copperplate Gothic No. 22	3 fonts	1.70	5.10
6-point Heavy Copperplate Gothic No. 23	3 fonts	1.70	5.10
6-point Heavy Copperplate Gothic No. 24	3 fonts	1.70	5.10
12-point Heavy Copperplate Gothic No. 25	3 fonts	2.50	7.50
12-point Heavy Copperplate Gothic No. 26	3 fonts	2.50	7.50
12-point Heavy Copperplate Gothic No. 27	3 fonts	2.50	7.50
12-point Heavy Copperplate Gothic No. 28	3 fonts	2.50	7.50
10-point Extra Condensed Title Gothic No. 12	3 fonts	2.30	6.90
12-point Extra Condensed Title Gothic No. 12	3 fonts	2.50	7.50
24-point Extra Condensed Title Gothic No. 12	2 fonts	4.20	8.40
30-point Extra Condensed Title Gothic No. 12	2 fonts	4.25	8.50
36-point Extra Condensed Title Gothic No. 12	2 fonts	4.60	9.20
48-point Extra Condensed Title Gothic No. 12	1 font	6.20	6.20
60-point Extra Condensed Title Gothic No. 12	1 font	5.50	5.50
72-point Extra Condensed Title Gothic No. 12	1 font	6.75	6.75
10-point Wedding Text	3 fonts	4.20	12.60
12-point Wedding Text	2 fonts	4.60	9.20
14-point Wedding Text	2 fonts	5.00	10.00
18-point Wedding Text	2 fonts	5.40	10.80
8-point Cloister Oldstyle	3 fonts	4.70	14.10
10-point Cloister Oldstyle	3 fonts	5.20	15.60
12-point Cloister Oldstyle	3 fonts	5.80	17.40
18-point Cloister Oldstyle	3 fonts	6.80	20.40
24-point Cloister Oldstyle	2 fonts	7.30	14.60
8-line Wood Caps Class O, No. 728	120 pcs.	.08	9.60
8-line Wood Figures Class O, No. 728	26 pcs.	.08	2.24
12-line Wood Caps Class O, No. 728	120 pcs.	.12	14.40
12-line Wood Figures Class O, No. 728	26 pcs.	.12	3.12
6-point Braces	1 font	1.50	1.50
6-point Dashes	1 font	1.50	1.50
8-point Cheltenham Oldstyle Fractions	2 fonts	1.34	2.68
10-point Cheltenham Oldstyle Fractions	2 fonts	1.22	2.44
12-point Cheltenham Oldstyle Fractions	2 fonts	1.10	2.20
6-point Spaces and Quads	5 lbs.	.....	3.75
8-point Spaces and Quads	10 lbs.	.....	6.20
10-point Spaces and Quads	40 lbs.	.....	20.60
12-point Spaces and Quads	5 lbs.	.....	2.60
18-point Spaces and Quads	5 lbs.	.....	2.45
14-point Spaces and Quads	5 lbs.	.....	2.50
24-point Spaces and Quads	5 lbs.	.....	2.40
30-point Spaces and Quads	2 fonts	2.35	4.70
36-point Spaces and Quads	2 fonts	1.00	2.00
48-point Spaces and Quads	1 font	1.40	1.40
60-point Spaces and Quads	1 font	1.65	1.65
72-point Spaces and Quads	1 font	2.00	2.00
Ornaments, Choice	3 pcs.	.....	.....
Type Borders, Choice	2 fonts	3.00	6.00
Steel Perforating Rule, No. 806	2 feet	.33	.66
6-point Dot Leaders	5 lbs.	1.50	7.50
6-point Hyphen Leaders	5 lbs.	1.50	7.50
2-point Labor-Saving Leads	100 lbs.	.30	30.00
6-point Labor-Saving Slugs	100 lbs.	.30	30.00
Labor-Saving Metal Furniture	100 lb.	.....	40.00
2-point Labor-Saving Brass Rule, No. 1002	10 lbs.	.....	23.00
2-point Labor-Saving Brass Rule, No. 2082	10 lbs.	.....	23.00

Machinery

	Amount	Cost per lb. or font	Total Cost
Two-Revolution Cylinder Press, 26 x 38 in., with Regular Equipment, F.O.B. Factory	1	.....	2,125.00
Motor, ½ H. P., Variable-Speed	1	.....	350.00
Omaha Folder No. 2, for Same	1	.....	440.00
New Series Chandler & Price Press, 10 x 15 in., Regular Equipment	1	.....	395.00
Pulley and Motor Bracket	1	.....	23.00
Motor, ½ H. P., Variable-Speed	1	.....	102.00
New Series Chandler & Price Press, 12 x 18 in., Regular Equipment	1	.....	490.00
Pulley and Motor Bracket	1	.....	23.00
Motor, ¾ H. P., Variable-Speed	1	.....	113.00
Advance Lever Paper Cutter, 30 in	1	.....	340.00
Extra Knife	1	.....	14.35
Advance Lever Paper Cutter, 26¼ in	1	.....	255.00
Extra Knife	1	.....	11.20

Hand Tools and Supplies

	Amount	Each or Doz.	Total Cost
Hempel Quoin Keys	2	.65	1.30
Improved Hempel Quoins	2 doz.	2.50	5.00
Spring-Tongue Gauge Pins	2 doz.	2.80	5.60
Oil Cans	2	.75	1.50
Waste Cans, Justrite No. 3	2	5.00	10.00
All-Brass Galleys, 6 x 10 in	5	3.45	17.25
All-Brass Galleys, 10 x 16 in	6	4.80	28.80
Pressed-Steel Galleys, 6¼ x 23½ in	30	.50	15.00
Composing Sticks, 6 x 2¼ in	20	4.75	95.00
Composing Sticks, 8 x 2¼ in	6	5.25	31.50
Composing Sticks, 12 x 2¼ in	2	6.25	12.50
Miller Mallets, No. 8	2	1.25	2.50
Type Planers, 3¼ x 8 in	2	.50	1.00
Proof Planers, 3¼ x 8 in	2	1.10	2.20
Success Nonexplosive Benzine Can, 1 Pint	3	1.00	3.00
Round-End Spatula, 8 in	1	.....	1.00
Square-End Spatula, 6 in	1	.....	.75
Ink Knife, Style A, 6 in	1	.....	.75
Ink Knife, Style B, 8 in	1	.....	1.75
10-in. Bellows	1	.....	2.75
Lye Brush No. 20	2	.75	1.50
Benzine Brush	2	.50	1.00
Hand Ink Roller	1	.....	2.60

Composing-Room Equipment

	Amount	Each	Total Cost
Type Cabinet, No. 2005, Regular Equipment	2	200.00	400.00
American School Type Cabinet, No. 9178	6	47.50	285.00
American School Compositors' Desk and Stand, No. 9177	3	34.75	104.25
American School Imposing Table	1	.....	125.00
Marble Surface for Same	1	.....	34.00
American Cut-Cost Brass Rule, Quotation, and Metal-Furniture Cabinet, No. 547	1	.....	72.00
American Cut-Cost Brass Rule, Quotation, and Metal-Furniture Cabinet, No. 9044	1	.....	71.00
Hamilton Square-Leg Imposing Table, No. 4090	1	.....	26.00
Marble Surface	1	.....	36.00
Drying Rack and Stock Table, No. 5135	1	.....	100.00
Hamilton Pressroom Dry Rack, No. 5160	1	.....	56.00
Galley Rack, No. 3601	1	.....	8.50
Labor-Saving Wood-Furniture Cabinet, No. 3728	1	.....	11.50
Rule Cases, No. 2835	2	2.80	5.60
Leader Cases, No. 2870	2	1.70	3.40
Proof Press, 16 x 31 in	1	.....	90.00
Challenge Proof Press, No. 1, 10¼ x 32 in	1	.....	70.00
Lead and Rule Cutter, No. 30	1	.....	35.00
Steel Cutting Rule, No. 102	10 ft.	.10	1.00

Bindery Equipment

	Amount	Each	Total Cost
Hand-Power Punch Machine	1	.....	25.00
No. 5 Boston Wire Stitcher and Spool Steel	1	.....	201.00
Boston Stapler, Foot-Power	1	.....	45.00
Perforator, 28 in., Foot-Power	1	.....	300.00
Hand Perforator, 10 in	1	.....	65.00
Counter, Model D	1	.....	6.75
Hand Numbering Machine	1	.....	12.00

FARM-SHOP EQUIPMENT FOR RURAL AND VILLAGE HIGH SCHOOLS

Louis M. Roehl, Asst. Prof., Department of Rural Engineering, Cornell University, Ithaca, N. Y.

The following list of shop equipment is for rural and village high schools where the number of boys who will be in the shop at one time is not apt to be over ten. The equipment is planned to have more than one kind of work going on at one time. Carpentry or woodworking, cold-metal working, soldering, painting, glazing, harness repairing, saw filing, tool grinding, handle fitting, concrete work, pipe cutting and threading, ropework, attaching builders' hardware, machinery repairing, electrical work, and household mechanics are the kinds of work that may go to make up the course of work and study. It will be noted that the range of tools is rather large, but there are but a few of any one kind—one of each in many instances. They are carefully selected so that the limited funds will make possible the greatest variety of educational experience to the boys and that many of them will be in use at one time. The reader will also note the entire absence of

machinery. This is because what work is done by the boys after leaving school is done without machinery. It will be done with the identical equipment that was used at school.

Should it be desired on the part of the school officials of any community to extend the equipment for any one line of work, their task is to add more of the tools for the kind of work desired, so that all or more boys can work at it at one time, but not to purchase other tools. The equipment as listed makes possible learning to do the work which is part of the everyday life of the people of the farming and village community.

The prices of tools have not been given in this tabulation, because there is such a variance in different localities and with different dealers. A careful check-up of the list with one of the large farm mail-order catalogs would indicate that the cost is slightly under $300.00, not figuring the labor for constructing the benches. It is safe to say that the total cost for a very good grade of tools will be under $350.00.

Shop Equipment for Rural and Village High Schools

1 6-student workbench.
2 single workbenches with one wood and one metal vise each.
4 claw hammers.
2 24", 8-point, crosscut hand saws.
2 22", 10-point, crosscut hand saws.
2 26" hand ripsaws.
2 24" steel squares.
6 14" iron jackplanes.
1 ratchet brace, 10" sweep.
2 ratchet braces, 8" sweep.
1 full set of auger bits 4/16" to 16/16" by 16ths, and one extra each 1/4", 5/16", 3/8", 1/2", and 1".
2 12" hand screw clamps.
6 combination miter and try-squares, 12".
2 14" pipe wrenches.
1 pipe vise.
1 chain drill.
Square bit stock drills as follows: 4⅛", 4¼", 4⅜", 4⅝", 2 2⅜", 2⅝", 1 1⅞", 1 1⅞", 1½", 1⅝", 1¾".
1 pipe cutter.
1 set of stocks and dies for threading pipe, ½" to 1¼".
2 hand drills.
2 sets of 9 twist drills: 1/16", 1/8", 3/16", 7/64", 1/8", 9/64", 5/32", 11/64", 3/16".
1 6" carpenters' pinchers.
2 6" slip-joint pliers.
2 cold chisels, ½".
2 cold chisels, ⅜".
3 rose-head countersinks.
3 5/32" nail sets.
2 screw-driver bits; one medium and one large.
6 6" screw drivers.
4 8" screw drivers.
3 ¼" chisels.
3 ½" chisels.
3 ¾" chisels.
1 1" chisel.
1 doz. 6" slim-taper triangular files.
1 8" regular-taper triangular file.
2 10" rat-tail files.
½ doz. 10" flat mill files.
3 10" flat bastard files.
3 10" half-round bastard files.
1 12" half-round wood rasp.
8 woodworkers' vises for workbenches.
1 auger-bit file.
1 marking gauge.
1 26" spirit level.
1 cabinet scraper.
1 4½" broad hatchet.
2 8" steel wing dividers.
1 10" T bevel.
2 8" T bevels.
1 24" wrecking bar.
1 2¾-lb. wooden mallet.
6 interchangeable file handles.
1 2" x 8" combination carborundum oilstone.
1 12" compass saw.
1 coping saw.
1 10" draw knife.
1 hand-saw set.
1 timber-saw set.
1 crosscut-saw tool.
2 saw filing clamps.
1 blacksmiths' solid box vise, 4" jaws.
1 machinists' vise, 3½" jaws.
1 hack-saw frame, with dozen blades.
3 2-lb. machinists' hammers.
2 1-lb. machinists' hammers.
1 3-lb. blacksmiths' hand hammer.
1 8" monkey wrench.
1 18" monkey wrench.
2 8" adjustable S wrenches.
2 6" adjustable S wrenches.
2 cold chisels, ¼".
2 hand punches, ⅛".
2 hand punches, 1/16".
2 hand punches, ¼".
2 hand punches, 5/16".
2 hand punches, ½".
1 set socket wrenches.
2 rivet sets.
1 whetstone.
2 taper-point soldering irons.
2 wooden handles for soldering irons.
1 pound acid-core wire solder.
1 pound rosin-core wire solder.
1 1-qt. blowtorch.
1 automatic alcohol blowtorch.
3 center punches.
1 tinners' snips.
1 12-oz. riveting hammer.
1 screw plate (stock and dies): ¼-20, 5/16-18, ⅜-16, 7/16-14, ½-13.
1 emery grinder (electrically driven or foot power).
1 4-tube spring punch.
1 trimming knife.
4 awl hafts, and 4 assorted blades.
1 finishing wheel.
1 Rex riveting machine.
2 stitching clamps.
2 balls No. 10 white linen thread.
1 doz. boxes of assorted tubular rivets.
2 pounds of assorted copper rivets.
2 papers of sewing needles, assorted.
12 balls harness-makers' wax.
1 piece beeswax.
2 oval varnish brushes, 1", 2".
3 flat varnish or paint brushes, 1", 2", and 3".
2 putty knives.
6 glass cutters.
10 boxwood rules, 2-ft., 4-fold.
3 half-pint oil cans.
1 D-handle square-point shovel.
1 long handle round-point shovel.
1 brick trowel.
1 plastering trowel.
1 sidewalk edger.
1 sidewalk groover.
1 cast iron tamper.
1 garden rake.

THE SCHOOL SHEET-METAL SHOP: TOOLS, MACHINES, SUPPLIES

J. A. Brandt, Mooseheart Vocational School, Mooseheart, Illinois

IT IS impractical to compile a minimum list of tools, machines, and supplies that will fully meet the requirements of all school shops. The variety and size of practical jobs and projects available for shopwork in the various schools will have considerable bearing on the selection of the equipment and supplies.

The following lists include supplies and equipment that have proved satisfactory in the Mooseheart sheet-metal shop, where the classes range from the most elementary to those in advanced trade work.

In the advanced work "jobs" are frequently encountered for which special machines are required, machines which are not a part of the equipment of this shop. Some of them would be included if floor space permitted, while others would be used so seldom that they could not be considered a good investment.

Where certain machines have not been available, other ways have been found to do the work satisfactorily. When the shop to be equipped is to be used entirely for elementary classes, tools, machines, and supplies marked with an asterisk (*) need not be ordered.

Where one make of tool is recommended in preference to another, the reason for this preference will be given if possible.

The following firms will furnish on request catalogs and other literature that should be in the hands of all teachers in sheet-metal work: The Peck, Stow & Wilcox Company, Southington, Conn., catalogs of tools, machines, and several pamphlets on projects, equipment and shop layouts; Niagara Machine & Tool Works, Buffalo, New York, catalog of tools and machines; Dreis & Krump Manufacturing Company, 7404 Loomis Street, Chicago, Illinois, catalog of brakes, etc.; The Johnson Gas Appliance Company, Cedar Rapids, Iowa, catalog of furnaces; Charles A. Hones, Inc., 124 Grand Ave., Baldwin, L. I., N. Y., catalog of furnaces; Berger Bros. Co., 229-237 Arch St., Philadelphia, Pa., catalog of machines, tools, and materials of leading manufacturers.

In listing the supplies, it is planned that vocational students will construct articles for home and school use that will have a commercial value that will more than pay for the materials used. Only the highest grade of tools and machines are included in these lists, as they will be required to stand greater use and abuse than the same equipment stands in the commercial shop. All lists are compiled for classes where the instruction is individual.

The quantities will not be satisfactory where the entire class is assigned the same project at the same time. The lists include a small reserve of tools that are frequently lost or worn out. Peck, Stow & Wilcox Company's hand tools have been specified where their use guarantees longer life. Other brands can be substituted if similarly constructed.

The method of caring for the tools has considerable bearing on the number required, and for that reason the following method is explained. All tools are returned to a toolroom before a class is dismissed. No tools are assigned individually; neither is a check system used. A small deposit should be made by each student to cover tools lost.

MACHINES AND EQUIPMENT

12 P. S. & W. Co. No. 794 Gas Furnace, double burner or furnaces manufactured by The Johnson Gas Appliance Company, Cedar Rapids, Iowa, or by Charles A. Hones, Inc., 124 Grand Ave., Baldwin, L. I., New York, can be substituted. The furnaces manufactured by the last two firms generate a greater heat, but when used require considerable supervision of the instructor to prevent coppers being burnt.

24 Machinists' vises, 3-in. Any standard make.
1 Machinists' vise, 4 or 5 in. Any standard make.
1 Slip-roll former, 30-in., either P. S. & W. Co. No. 382A, or Niagara 2x30 in. (3rd-roll drive optional with instructor). The Niagara make has the most efficient front roll lock.
1 Bar folder, P. S. & W. Co., 20¾ in., No. 62B.
1 Bar folder, 21-in. Niagara Keystone. Note: One folder will be sufficient in small classes.
1 "Chicago" Cornice Brake, 4 ft.
1* "Chicago" Cornice brake, 8-ft., manufactured by Dreis & Crump, Chicago. } Light, easy to handle and reasonable in price.
2 Small burring machines (with three extra upper faces) and standard P. S. & W. Co. No. 579 encased pattern or Niagara "Superior" encased pattern.
2 Large burring machines (with three extra upper faces) and standard P. S. & W. Co. No. 580 encased pattern or Niagara "Superior" encased pattern.
1 Wiring Machine with standard P. S. & W. Co. No. 526A enclosed pattern or Niagara "Superior" encased pattern.
1* Elbow-edging machine with standard. P. S. & W. Co. No. 550A, with 1 extra pair No. 4 rolls or the Niagara "Buffalo" with one pair each of No. 4 and No. 10 rolls.
1 Small turning machine (encased pattern) with standard P. S. & W. Co. No. 545 or Niagara "Superior."
1* Large turning machine (encased pattern) with standard P. S. & W. Co. No. 546 or Niagara "Superior."
1 Setting-down machine with standard P. S. & W. Co. No. 561 or Niagara "Superior."
1* Crimping machine with standard P. S. & W. Co. "Common Sense" combination crimping and beading machine with one pair each of straight and spiral crimping rolls, or Niagara "Buffalo" crimper and beader with 1 pair each straight and spiral crimping rolls and 1 set of plain collars for same.
1* Beading machine with large floor standard P. S. & W. Co. No. 617B with No. 979 standard or Niagara No. 1 and heavy floor standard, with 2 7/16-in. hole. An assortment of rolls is furnished with both machines that will be satisfactory on most work.
1* Double-seaming machine, P. S. & W. Co. No. 640. A special base should be built in the shop for this machine. The operation of the machine is simple and its capacity sufficient for all schoolwork.
1 Squaring shear with finger guard, side tables, wood shelf and complete gauge equipment. P. S. & W. Co. No. 132A or Niagara "Queen City" 30-in., complete as above.
* In trade work where longer cuts are necessary, (cuts over 30 in.), there are several machines that will meet the requirements, depending on the kind of work to be done. Selection of the method or machine to be used must rest with the individual instructor. If a regular squaring machine is to be used it should have not less than 52-in. cut and be equipped with hold-down attachment. Also see P. S. & W. Co. No. XC36 and Niagara gap shears. In some shops rotary slitting shears will answer the purpose. See P. S. & W. Co. No. 255A and Niagara No. 16. Several firms manufacture cutting attachments for 8-ft. cornice brakes. Write The Maplewood Machinery Company, 2638 Fullerton Ave., Chicago, Ill., for descriptive circular. In this shop a Niagara 52-in. "Hercules" squaring shears and a P. S. & W. Co. No. 255A slitting shears are used.
1 Circular shears. P. S. & W. Co. No. 280A or Niagara "Waugh's" circular shears No. 2 It has been found convenient to have the circular shears mounted on a small-wheeled bench, height of bench 30 in.
1 Bench punch. P. S. & W. Co. No. 675A, with regular punches and with the following extra equipment:
6 extra 1/8-in. and 7/16-in. punches.
2 extra 1/4-in. punches.
3 extra 1/8-in. and 7/16-in. dies.
1 extra 1/4-in. die.
This machine is recommended due to its rugged construction and simplicity in changing dies and adjustments.
1 No. 2 portable punch with regular punch and die equipment and the following extras: 3, 1/8-in. and 7/16-in. punches; 1, 1/4-in. punch; and 1, 1/8-in., 7/16-in., and 1/4-in. dies. Manufactured by W. A. Whitney Mfg. Co., Rockford, Ill.
1 Brace and wire bender, P. S. & W. Co. No. 402 or the same of Niagara make.
1 Grooving machine with 3/16-in., 1/4-in., and 1/8-in. grooving rolls. P. S. & W. Co. No. 518B or Niagara "Queen City" No. 1, 30-in.
1 Wire cutter, P. S. & W. Co. No. 490.
2 Wire reels, P. S. & W. Co. No. 758.
The following machines are suggested as being desirable for the school shop having an outlet for a large variety of work.
1* Pan-forming machine with the regular die bed and the following widths of forming blades: 1 each 2½, 3, 4, 5, 6, 8, 10, 12, 16, 18 and 25-in., P. S. & W. Co. No. 436.
1* Combination punch-and-bar shear. No. 3½, with regular equipment, manufactured by the Buffalo Forge Co., Buffalo, New York.
1* Throatless shears with bench mounting equipment, Marshalltown No. 18. manufactured by the Marshalltown Mfg. Co., Marshalltown, Iowa.

SUPPLIES

25 to 100 lb. warranted half-and-half solder, 3/8-in. triangular bars. All solder should be purchased through reliable dealers or direct from manufacturer. Triangular bars are used, because there is less waste in their use.
1 Bundle 12-ga. coppered market wire (65 to 100 lbs. per bundle catch weight).
1 Bundle 9-ga. same. Coppered wire is recommended as it resists rust, slides easily, and can be soldered if necessary. American Steel & Wire Co. gauge used.
3 Lb. 8-oz. metallic tinned tinners' rivets.
5 Lb. 5-lb. metallic tinned tinners' rivets.
5 Lb. 1½-lb. metallic tinned tinners' rivets.
5 Lb. 2-lb. metallic tinned tinners' rivets.
5 Lb. 3-lb. metallic tinned tinners' rivets.
10 Lb. 5-lb metallic tinned tinners' rivets.
10* Lb. 7-lb. metallic tinned tinners' rivets.
300 7/8 x ½-in. round-head stove bolts.
300 7/8 x ¾-in. round-head stove bolts.
300 7/8 x 1-in. round-head stove bolts.
3 Gross No. 40 wrought Star ears (tinned).
3* Gross No. 2 malleable Star ears (galvanized).
2 Gross 4-in. enameled bail woods.
1 Case 20 x 28 in. IC prime bright coke tin.
3 Bundles 30-ga. 30 x 96 in. galvanized steel.
3* Bundles 26-ga. 30 x 96 in. galvanized steel.
2* Bundles 26-ga. 30 x 96 in. one pass cold-rolled steel.
½ Gross ½- or ¾-in. zinc can screws.
½* Gross 1½-in. zinc can screws.
1 Doz. ¼-lb. cakes of Speco, manufactured by the Special Chemical Company, Highland Park, Ill.
5 Lb. resin.
5 Lb. commercial (granular) salammoniac (ammonia murate).
½* Gal. National tinners' red (paint) manufactured by National Paint & Varnish Co., Cleveland, Ohio.
2 Gal. muriatic acid (commercial).
5 Lb. scrap zinc. The last items are necessary only when cut acid is to be made in the shop for use as a flux.

TOOLS

2 Doz. 10-in. hand bastard files, one safe edge.
14 Setting hammers, 7/8-in. face.
10 Riveting hammers, 7/8-in. face.
24 Pairs Weiss or P. S. & W. Co. No. 9, straight blade tinners' snips, 3-in. cut. Note: Smaller snips have been tried out for the elementary classes and were unsatisfactory.
6 Pairs Weiss or P. S. & W. Co. No. C9, 3-in. cut, circular snips.
3* Pairs combination circular and scroll snips, 3-in. cut.
2* Pairs No. 2 double-cut shears.
3 Hand groovers, No. 6.
4 Hand groovers, No. 4.
2 Hand groovers, No. 0.
2* Nickel-plated circumference rules, 3-ft.
1* Nickel-plated circumference rule, 4-ft.
24 No. 34 Stanley 2-ft., no-fold rules.
1 Each, ½, 5/8, ¾, 7/8, 1, 1½, 1¾, 1¾, and 2-in. hollow punches.
6 No. 8 rivet sets and headers.
6 No. 6 rivet sets and headers.
6 No. 4 rivet sets and headers.
3 No. 2 rivet sets and headers.
2 No. 1 rivet sets and headers.
12* Wire chisels, ½-in.
12 Wire chisels, ¾-in.
12* Wire chisels, 1-in.
36 Hickory mallets, 2-in. face.
8 Pairs 8-in. Button's pliers.
4* Pairs 10-in. Button's pliers.
2* Pairs 12-in., 1½-in.-face cutting nippers with interchangeable cutters.
3 Pairs Handy seamers, adjustable, with 3½-in. blade.
8 Pairs P. S. & W. Co. wing dividers.
6 Pairs P. S. & W. Co. extension wing dividers.
6* Triangular plumbers' scrapers.
6 P. S. & W. Co. 4-in. screw drivers.
4 P. S. & W. Co. 6-in. screw drivers.
2 P. S. & W. Co. 12-in. screw drivers.
6 Center punches.
3 Doz. ring scratch awls.
2 Doz. prick punches.
15 Pairs 3 or 4-lb. soldering coppers.
3* Pairs 6-lb. wedge-shaped bottom soldering coppers.
3 Doz. handles for soldering coppers.
2 Doz. 8-in. bench brushes.
2* Pairs No. 50B L. S. Starrett Co. trammel points (not adjustable).
2* Pairs No. 50A same (adjustable).
1 Hand drill, ¼-in capacity.
12 Drills, 1/8-in.
12 Drills, 7/16-in.
6 Drills, ¼-in.
2 No. 145 Starrett hack-saw frames, 8 to 12-in.
2 Doz. blades for same.
1 Set 7/16-in. steel letters and numbers.
1* Each, No. 1, 2, 3, and 4 raising hammers with handles.
1 Monkey wrench, 8-in.
1 Monkey wrench, 15-in.
1 Pipe wrench, 18-in.
4 Standard 2-ft. steel framing squares.

STAKES

2 Hollow-mandrel stakes, P. S. & W. Co. No. 910 or Niagara No. 0.
1 Beak-horn stake, P. S. & W. Co. No. 901.
2 Blow-horn stakes, P. S. & W. Co. No. 925 or Niagara (give name).
2 Hatchet stakes, 13-in. blade, P. S. & W. Co. No. 943 or Niagara No. 2.
2 Square-head stakes, 2½x4½ in. face, P. S. & W. Co. No. 932 or Niagara (give size).
2 Square-head stakes, 3x5 in. face, P. S. & W. Co. No. 938 or Niagara (give size).
2 Double-seaming stakes, P. S. & W. Co. No. 921 or Niagara (small size).
1 Candle-mould stake, P. S. & W. Co. No. 956 or Niagara (give name).
1 Needle-case stake, P. S. & W. Co. No. 957 or Niagara (give name).
1 Double-seaming stake with 4 heads, P. S. & W. Co. No. 949 or Niagara (give name).
The following items can be secured from local sources at a small cost:
2 Pieces of railroad rail about 5 ft. long.
A number of pieces of pipe of varying diameters, about 3 ft. long, with ends cut square in a lathe.
6 Pieces railroad rail, 6 in. to 12 in. long.
12 Small dip pots.
12 Small acid or flux pots.

EXACT MEASUREMENTS ARE AN IMPORTANT ELEMENT IN THE TEACHING OF MACHINE-SHOP PRACTICE.

EQUIPMENT FOR THE HOME-ECONOMICS DEPARTMENT

Alice H. Haley, St. Paul, Minn.

The purchaser who buys garments that are misfits, who invests "because it was cheap and it may some time be needed," or who brings home the article the zealous saleswoman urged rather than the one sought, is a familiar figure to all. Unfortunately, the home-economics department is frequently equipped by just such a purchaser.

Every workman realizes the need for having the proper tool for each job. Every skilled worker realizes that the position and arrangement of these tools materially affect production. This knowledge used effectively in the business world is too often ignored in educational work. A careful analysis of the uses to which the department will be put and of the available facilities is the only sensible way to attack the problem of equipping.

General Factors

There are many factors which influence the choice of equipment, but most of these depend upon local conditions. These conditions are not stable; they vary according to the situation found in each community and therefore tend to modify original plans. There are really only two general factors which must be considered: (1) The aims and objectives of the work. (2) The courses which will be taught.

The Aims and Objectives of the Work

Several types of home-economics work are offered in the public schools today. There are those classes which have for their aim a general education; those which have future home-making for a goal; those giving trade instruction in home economics subjects; those which offer part-time and continuation work; and classes for adults, which are usually held in the evening. All of these types of home-economics work have different purposes. Equipment used for teaching is simply a means to an end. When the course is planned with a definite objective, the equipment should be such as will help in every way possible to further this aim, but when the objective is changed, if the equipment is to be adequate it too may need to be changed. This, of course, is also true of the arrangement. Certain combinations of uses for equipment may be satisfactorily made if it is remembered that the purpose of teaching is a vital factor in the choice of equipment.

The Courses to be Taught

Does the *course of study* call for only work in foods and clothing? If so, the equipment problem is not hard to solve, at least comparatively speaking, for under these conditions space and equipment need be provided for only cooking and sewing. If, however, the course calls for such units as child care and training, related art and science, home equipment, and textiles, the problem which confronts one is of a very different character. It is indeed difficult to find space for teaching facilities, as well as to make provision for storage of supplies, in these complementary fields.

The *time element* as outlined by the course of study is another important item. If class periods are short, efficient arrangement, and choice of equipment must be made to facilitate quick work on the part of the pupils.

Still another thing which influences choice is the *plan of work* advocated, that is, will the teacher use project teaching, will she have the pupils work in groups of family size, or will all work be done on the individual basis? The more varied the course of study, the shorter the period, the more definite the plan advocated for class management, the more exacting are the demands made upon the equipment.

Modifying Factors

Under ideal conditions the general factors discussed are the only ones which have to be considered in equipping for the teaching of home economics. But unfortunately, few, if any, of us are able to work under ideal conditions and there are many factors which demand modifications of the ideal.

1. The type of community which is to be served by this department—the nationalities represented, their standards of living, and the geographic location.
2. The amount of space available.
3. The location of this space in relation to the heating and ventilating system, the water supply, the building entrances, and the position of other departments.
4. The number of pupils to be accommodated—the size of each class and the number of classes.
5. The money available.

Type of the Community as a Determining Factor.

Home-economics equipment should be planned with the idea of setting an ideal before the pupils, but there is such a thing as making this ideal so far beyond their power of attainment as to make it almost impossible of comprehension. Take the matter of fuels for example. It is surely not in keeping with the standards of living in a community set in the midst of the prairie to equip their consolidated school with electric stoves, even though electric power is obtainable for school use. An ideal is not really an ideal unless it is something which can be attained through effort on the part of the individual. If most of the patrons of the school come from homes having but one or two rooms, a home-economics department having foods and clothing laboratories, dining and living room, as well as a bathroom, entails a needless expenditure of funds.

A knowledge of community life and of community interests is very essential if wise decisions are to be made regarding the amount of space needed and the choice and arrangement of furnishings. Should the community desire to use the department as a recreational center, equipment which will stand hard usage must be chosen, and it should be so arranged that free floor space may be available when needed.

The Amount of Space Available

The space which is desirable will depend only upon the general factors already mentioned; that which is available is another story. The rooms provided for the work are usually the same size as other classrooms. The accepted standard size is 30′ x 22′. When larger rooms are requested—either because of the size of the classes or the size and style of equipment, or because the desired arrangement of furniture takes up more space—it often involves the changing of fundamental points in the construction of the whole building. There are times, of course, when larger rooms are desirable and necessary, but those planning for a new department should thoughtfully contrast the benefits to be derived from the larger rooms with the drawbacks which are entailed in obtaining them.

Minimum space for the town having a school population of 300 to 400 pupils would be a clothing laboratory, a foods laboratory, a dining room, and adequate storage space. There are small schools that manage fairly well with but the two laboratories, having a part of one or the other set aside for the dining-room equipment. In fact, acceptable work is being done in some places—where the enrollment is very small—in one large room containing the equipment necessary for all the types of work which need to be offered.

Then, of course, this space may be enlarged to provide fitting room, bedroom, living room, and bath, as well as the three almost essential rooms mentioned above. Combinations of these rooms are sometimes found very practical. In fact,

some home-economics people contend that the very best way of teaching this work is to provide a house equipped like a home. This idea may be carried out in either of two ways, an apartment within the school building, or a separate cottage built or remodeled for this express purpose.

The Location of the Space Within the Building

In deciding the question of whether the department shall be located in the basement, on the ground floor, the top floor, or in any other part of the building, several points should be taken into consideration:

1. Good light is essential to good workmanship.
2. It is not a good plan to have art and science departments located in a distant part of the building if close cooperation is desired.
3. Facilities must be provided for caring for the merchant's deliveries.
4. Odors of the cooking tend to rise and to find their way into the ventilating system.

The Number of Pupils to be Accommodated

A survey of the plans for home-economics work reveals the fact that some states advocate classes containing but sixteen pupils, while some city systems are demanding that teachers handle as many as 36 pupils in a single class.

The teacher-pupil load is today a much discussed topic in educational circles. The pupil load of the home-economics teacher is usually lighter than that of the academic teacher because of the double period used. In an effort to equalize the teaching loads in a school, administrators have either increased the number of pupils per class, reduced the length of the class period, or increased the number of teaching periods.

Every teacher, although she may know that she does the most satisfactory work when handling a class of a definite size, should realize that having classes of such a size involves administrative problems. As yet the optimum size has not been determined for either academic or home-economics classes. Surely there can be some adjustment which will satisfy both the teacher and the administrator. The majority of schools seem to be setting as a standard 20 to 24 pupils for each class until they can secure results of investigations on this problem.

Storage space must be provided for individual as well as general equipment in both food and clothing laboratories. The number of classes taught during a period of one week will largely determine the space which must be provided.

The Money Available

This factor needs very little discussion because, according to the old adage, "you can't get blood from a turnip." But it is surprising how frequently increased funds are available when plans are clearly presented with sound reasons for the choices made. The explanation for this is that the distribution of funds for necessary equipment is often made by people unfamiliar with the needs. The amount of money provided depends largely upon the attitude of those holding the purse strings, and therefore is not so unalterable a factor in determining the choice of equipment as many people consider it.

Arrangement of Equipment

The arrangement of equipment depends upon such important factors as:

1. Source of natural light.
2. Whether the equipment is to be used by groups or by individuals.
3. Amount of space needed for the efficient use of equipment; example: space required for setting up the ironing board or opening up the clothes rack for drying towels.
4. The accessibility of the source of supplies.
5. Need for care and repair; example: electrical and plumbing fixtures must be placed to facilitate repairwork.
6. Economy of time, energy, and money; example: the sinks should be so placed that a minimum of piping will be required.

Equipment in a food laboratory may be arranged in any of the following ways: (1) Hollow square; (2) "schoolroom" plan; (3) unit kitchen; (4) modification of the unit-kitchen plan.

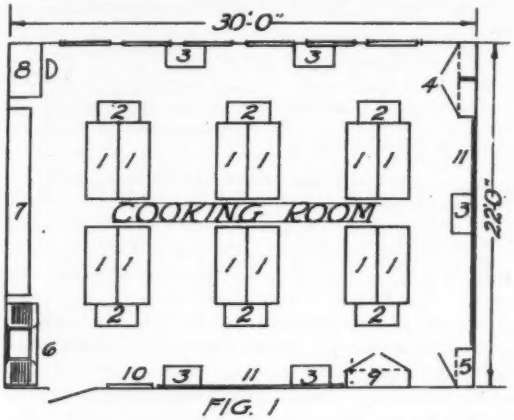


FIG. 1

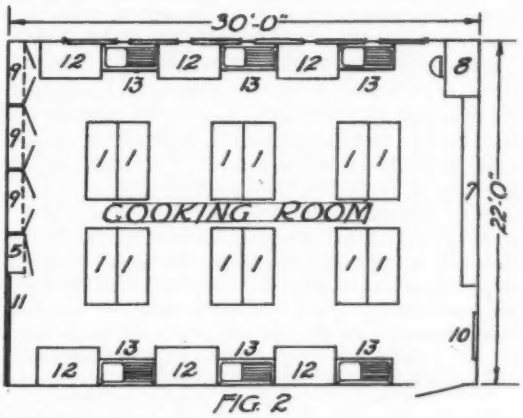


FIG. 2

LAYOUTS FOR COOKING ROOM.

Equipment Schedule: 1. Cooking table. 2. Oil stove. 3. Sink. 4. Oven cupboard. 5. Broom closet. 6. Sink. 7. Cupboard. 8. Teacher's desk. 9. Apron closet. 10. Bulletin board. 11. Blackboard. 12. Stove. 13. Sink.

The *hollow-square plan* calls for arranging the desks to conform with the general outline of the room. The individual stoves are placed on the top of each desk and the sinks are located either at each corner or in the center of each side of the square. The square should be broken in several places to permit easy passage from the outside to the inside of the square.

Advantages

1. Pupil's work can be easily supervised by the teacher.
2. Pupils are in good position to see demonstrations.
3. All desks are well lighted.

Disadvantages

1. There is waste space in the center of the square.
2. Some pupils have to walk a long way to get to the supply table.
3. Space between desks and walls is often inadequate.
4. Pupils are too scattered for satisfactory discussion of lessons.
5. Arrangement is different from that used in home kitchen.

In the *"schoolroom" plan* the desks are arranged in formal rows across the room so that every pupil faces the front. In the center of each row is a small kitchen sink, and individual stoves are used on top of the desks.

Advantages

1. Teacher can easily conduct recitation and demonstration lessons.

Disadvantages

1. Teacher cannot reach pupils quickly to give assistance.

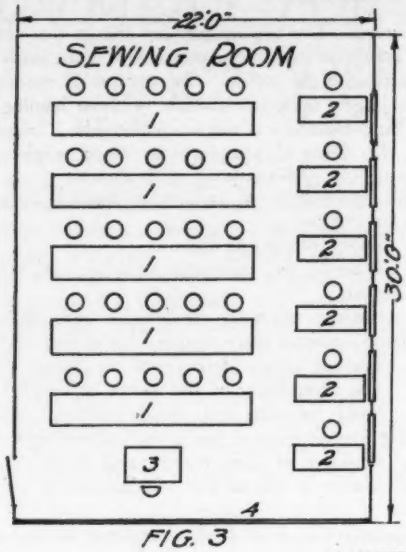


FIG. 3

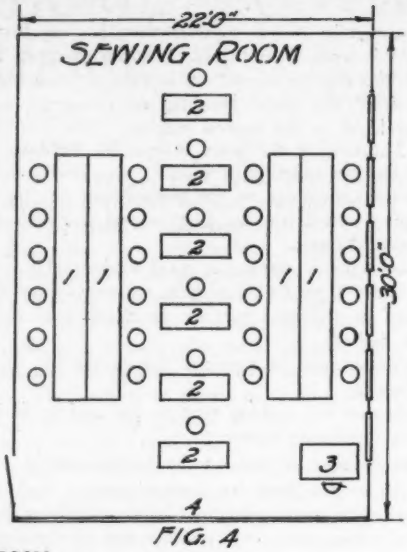


FIG. 4

LAYOUTS FOR SEWING ROOM.
Equipment Schedule: 1. Sewing table. 2. Sewing machine. 3. Teacher's desk. 4. Blackboard.

2. All can see board space easily.
3. More pupils are accommodated in a given space.

2. Teacher cannot see what girls in the back of the room are doing.
3. Pupils cannot reach supply tables easily.
4. Arrangement is different from that used in the home kitchen.

The *unit-kitchen arrangement* usually provides for from four to six miniature kitchens within the one large room. These kitchens may be separated by full partitions, by half partitions, or simply by the partitions made by the arrangement of the equipment. The equipment used is that found in the average home kitchen. The success of this arrangement—so its advocates claim—is that home duties may be taught in such a manner as to carry over into the home with little adaptation. This is made possible by approximating home conditions in the type and arrangement of equipment.

Advantages

1. Reproduce home conditions as far as possible.
2. Provides equipment like that used in a home.
3. Food may be cooked in family-size quantities.
4. Girls work in family-size groups.
5. Pupils may be given varied experience when units are equipped differently.

Disadvantages

1. Demands a more expensive type of equipment.
2. Supervision of the work is difficult.
3. Requires more floor space.
4. Recitation lessons are conducted with difficulty.
5. More workers in the home kitchen and so division of responsibility is not comparable.

The *modification of the unit-kitchen arrangement* attempts to use the good points of the unit-kitchen plan and yet takes into consideration the fact that after all, since the work is being done in a schoolroom, some modifications are necessary.

Two desks or modified kitchen cabinets are grouped with a stove and a sink to accommodate four girls. These groups or units are usually arranged in rows so that the teacher, by walking down the center aisle, can easily observe the work of the pupils. The plan has many possibilities. Two kitchen tables may be placed back to back and on them a row of painted cans to be used for staple groceries, while at one end there may be an oil stove. It is a simple, inexpensive plan and yet one which is adequate for successful teaching. Probably it is the simplest interpretation of the modified unit-kitchen idea and can be changed in a multitude of ways. Desks of the commercial type may be used, or kitchen cabinet tables; two-burner plates may be placed on top of the desks or kitchen ranges may be installed; sinks may be set beside the stove or at the other end of the desk; or stoves and sinks may be placed in a line along the walls of the room. It is comparatively easy to have the pupils work in groups of family size, also with such arrangements supervision is not difficult.

Advantages

1. Saves pupils' time, as stove, table, sink, and supplies can be reached with a minimum of steps.
2. Food may be cooked in family-size quantities.
3. This plan may be so adapted as to require a minimum expenditure of funds.
4. The arrangement lends itself to modification which meets the standards of living in the community.

Disadvantages

1. All girls do not face the same way, necessitating a rearrangement for demonstration and recitation work.

Equipment in the clothing laboratory may be arranged in the following ways: (1) hollow square; (2) parallel plan; (3) unit plan.

In the *hollow square* the tables conform to the shape of the room, with the pupils seated around the outside. The machines and other equipment may be arranged next to the windows or within the center of the square.

Advantages

1. Desk work is easily supervised by the teacher.

Disadvantages

1. Takes up much space.
2. Pupils cannot reach the machines easily.
3. The working space of all pupils is not well lighted.
4. Pupils are too far away from blackboard to see demonstrations easily.
5. Room has a cluttered appearance.

In the *parallel plan* several small or single large tables are arranged in rows. Pupils may be seated on both sides or all may face the front of the room. The machines are also placed in a line between the rows of tables, although there are times when they are placed in a row by the windows.

Advantages

1. This arrangement takes up comparatively small space.
2. Work is easily supervised both at desk and machine.
3. Machines are easily reached by the pupils.
4. The table arrangement is convenient for cutting.

Disadvantages

1. Light does not come from the correct angle for all pupils.
2. Allows easy intercourse among pupils.
3. In some rooms it is not easy to reach all pupils to supervise work.

The *unit plan* provides for tables so that four girls are seated at one large square table (frequently of pedestal type) or at two smaller tables placed together. These units are placed in rows and the machines are located by the windows.

Advantages	*Disadvantages*
1. Work is easily supervised, both at desk and machine.	1. Light comes from the wrong direction for half of the class.
2. Room has a pleasing appearance.	2. When large tables are used it is difficult to move furniture.
3. Tables are large enough to be used for cutting.	

The Cottage or Apartment

The modern tendency is to demand school conditions which are true to life. For this reason a number of states are advocating the use of a real house to accommodate the home-economics department. Most of these houses possess fully equipped clothing and food laboratories of a size sufficient to accommodate the average class. In addition, they have the rooms which are always found in a home. It is difficult to secure the normal home environment in any school situation. This plan, however, does have many advantages, and one which should be mentioned is the opportunity it affords for hospitality. Miss Jessie W. Harris, formerly state director of home-economics education for Texas, makes the following statement: "A homemaking department is housed more economically in a well-constructed separate house than in the more expensively constructed high-school building."

Another advantage lies in the unusual opportunities it affords for incidental teaching. Problems similar to those which arise in the average home present themselves, and the teaching done to aid the girls in solving these difficulties is so "pat" that it is never to be forgotten. It is no longer necessary to cope with many of the situations which occur because of the formal plan of the ordinary classwork. The informal teaching done as the result of the use of the cottage or apartment makes the situation so "real" to the minds of the pupils that the same problems do not develop.

There is, of course, ground for controversy on the merits of this plan for housing the home-economics department, but it is true that an effective piece of teaching, one which will carry over readily into the girl's home, can be done under such working conditions.

Aids in Choosing Furnishings

There are many styles of equipment to be found on the market, all of which have merit. The choice made depends upon the factors outlined above. There are, however, some additional facts about the furniture itself which it is desirable to know.

MATERIALS USED FOR DESK TOPS

Material	*Advantages*	*Disadvantages*
1. Wood	a. Quiet b. Comparatively inexpensive	a. Stains easily b. Warps unless well made of properly seasoned stock c. Cracks spread after continued use d. Is not fireproof
2. Varnished wood	a. Nonabsorbent b. Looks well	a. Hot dishes mar it b. Soap removes the finish c. Does not copy home conditions
3. Zinc	a. Quickly cleaned b. Nonabsorbent	a. Is hard to put on smoothly b. Unattractive c. Acids act upon it
4. Monel metal	a. Quickly cleaned d. Nonabsorbent c. Attractive	a. Milk stains it slightly b. Comparatively expensive
5. Tile	a. Easily cared for b. Attractive	a. Expensive b. Noisy c. Causes broken and chipped dishes
6. Porcelain enamel	a. Attractive b. Easily cleaned c. Does not stain d. Nonabsorbent	a. Expensive b. Under certain conditions tends to chip or crack c. Affected by acids d. Noisy
7. Glass—opalite vitrolite	a. Attractive b. Easily cleaned c. Does not stain d. Nonabsorbent	a. Expensive b. Cracks with heat unless very thick c. Scratches somewhat
8. Soapstone	a. Easily cleaned	a. Unattractive b. Expensive c. Absorbent

Sewing Tables

There are two types of sewing tables in common use, one patterned after the large kitchen table, and one having a pedestal consisting of a bank of drawers.

Plain Table

Advantages	*Disadvantages*
1. It may be shifted to any place to enable the pupils to get the best light for their sewing.	1. Time may be wasted by the pupils in collecting and putting away their sewing materials.
2. Several tables may be pushed together when cutting is in order.	2. The furniture in the room must be moved in order to get adequate cutting space.
3. The tables may be taken out of the room if it is necessary to do so, and the room may be used for purposes other than clothing work.	
4. Satisfactory tables may be obtained at a reasonable price when this type is chosen.	
5. The construction of this type of table is so simple that an order may be placed in the hands of a local cabinetmaker and satisfactory equipment thus be obtained at a much lower cost.	
6. The one drawer in the table may be used for small equipment, such as pincushions, tape measures, scissors, etc.	

Pedestal Table

1. It is large enough for cutting.	1. It is so large that in order to accommodate the usual number of pupils it is necessary to have a larger room than the average classroom, or else to have a room which presents a crowded appearance.
2. Sewing equipment and materials are stored conveniently, and can be used with the least expenditure of time and energy on the part of the pupils. There are enough drawers to take care of two or more classes in clothing.	2. It is so heavy that it is practically stationary. This means that the room can be used for no other purpose than for a clothing laboratory.
	3. It is an expensive piece of equipment.

Storage Equipment

It is more satisfactory to have cupboards and lockers built in than to buy this equipment. The final cost is usually much less and every inch of available space may be utilized by a carpenter, while commercially built cupboards are often misfits. This plan provides an opportunity to have practical space for the storing of all types of equipment and supplies. For instance, in some schools it is necessary to use portable ovens, and racks are seldom built for storing them—they are usually stacked on the floor where they have to be moved whenever the floor is swept.

Damp towels must be hung up to dry. A rack placed in a cupboard behind a lattice door is fairly satisfactory, or one built in an alcove is sometimes used. Either of these methods obviates the unsightly use of the old-fashioned clotheshorse or the towels hanging on the desks.

Ironing boards built into cupboards have proved very satisfactory, although it is necessary to watch that the brace is so placed as to permit garments to be easily slipped over the end of the board.

When lockers are provided for cooking aprons they should be ventilated so that damp garments will not mildew.

Locker space provided for the individual sewing equipment should be large enough so that garments will not have to be literally rolled in a ball before they can be stored.

A cabinet or closet in which partially finished garments may be hung should be provided for the sewing laboratory. This closet should have a pole on which hangers can be placed, as it is essential that the garments be hung full length.

Bulletin boards are a necessary part of the equipment of each laboratory, and wall space should be provided for them.

Bookshelves are also an essential part of the equipment for each laboratory.

Summary

The general factors to consider in choosing equipment are the aims and objectives of the work and the kinds of courses which are to be taught. The equipment may be modified according to the type of community to be served, the amount of space available and where it is located, the number of pupils taking the work, and the amount of money which may be spent. Just what arrangement is followed in setting up this equipment is also an important item and will materially affect the efficiency of the teaching which is done. Equipping a new department is not a duty which should be undertaken lightly, but instead demands a thorough study of the situation and thoughtful planning.

HOW DO YOU SELECT YOUR MACHINE TOOLS?

A Few Practical Suggestions Which May Be of Service

Howard S. Rowland

The investment of several thousand dollars in the installation of a modern machine tool is a problem which warrants the utmost consideration on the part of those with whom the responsibility for this installation rests.

Consequently, it usually falls to one, or perhaps two or three individuals, to make a careful analysis of all factors influencing the purchase and erection of a given machine. In recent years, due to the fact that the number of available machines of given types has constantly increased, greater care must be taken and a more careful analysis made to make certain that all factors favorable to the school in making the purchase are given due and thorough consideration.

Experience with the purchase of machine tools by machine-shop instructors and boards of education throughout this country and in Canada indicates that there are a few important points which should not be overlooked.

Safety for the Boys When Operating

It is not infrequent to find two machine tools which apparently perform the same function with the same ease, and which frequently cost about the same. However, when it comes to the question of protecting the boys who will operate the machine, distinct differences will be found. The first and foremost consideration in installing a machine tool should be that of the *safety* of the boys who have to use it in the shop.

All moving parts, such as shafts, universal joints, driving pulleys, belts, etc., should be inclosed, or protected so that the clothing or hands of the boys cannot become entangled with consequential losses.

Although there are safety laws covering the erection and uses of machine tools in use in practically every state, the laws by no means cover the field as thoroughly as they should. Most machine-tool manufacturers are alert to the question of safety and have not only taken care of the points mentioned but have seen to it that clutches on handles are covered, that brakes are applied to the spindle so that the machine can be instantly stopped should an accident seem probable or should an accident occur, making it desirable to quickly stop all moving parts. The tendency of modern machine-tool design has been to put the motor inside the column of the machine, thus doing away absolutely with all danger of becoming entangled with the driving pulley or with the belt which previously ran from an overhead countershaft or from a motor mounted on the floor, or at the side of the machine.

How Much Does Price Count?

When it comes to the question of buying pencils, paper, rulers, desks, and equipment of like nature, price may be the important factor. When it comes to the question of using a textbook which contains information of value, price should be a secondary factor. So it is with a machine tool. Too many machine tools have been purchased on price, by teachers or school-board members who have been placed in authority to make the selection and who had not the remotest idea of the function or operation of the tool which they were specifying and buying. Price *is* a factor. But price *alone* is never a determining factor in the installation. The question of safety just referred to, and the other points which will be brought out below should form a large part—the predominating part in determining the selection of the tool, and price should be secondary. When a new machine tool has been bought, it is usually placed in the school shop for a good many years, and a few dollars' difference in the price of the tool at its installation when spread out over a number of years becomes very small. In practically every instance where there is a difference in price, this price is justified by features and factors which are more than worth the money asked for.

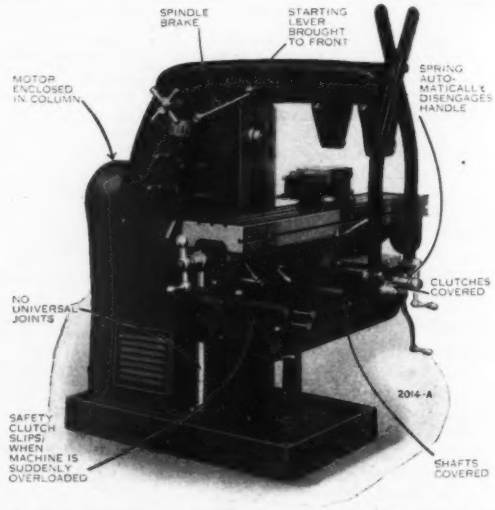
What of the Design?

The boys who will use the machine under consideration will later on be required to take up their places in industry either as operators of these machines, or as executives and men in authority who will determine the purchase, use, and installation of them.

Consequently, one of the most important factors to be considered when a new tool is up for review, is the question as to whether or not the machine represents one of current model or design. It should further be asked how long this particular model has been in use, and what the chances are for its redesign in the near future. As mentioned before, machine-tool design has undergone radical improvements in the past four years. New material, new methods of drive, new operating features, new control levers have all been added or altered, making the tool more productive, easier to operate, and safer to operate. Consequently, the manufacturer whose tools you are considering should be prepared to supply information which allows a fair conclusion on this point. Surely time would be wasted, if when equipping your present laboratory, or when considering the equipment of a new school, in which thousands of dollars have been invested, you install an obsolete model tool, and the boys receive instructions on this old machine. You are penalizing *them*, and you are not getting the greatest possible value from your new equipment.

The Reputation of the Machine-Tool Manufacturer

It is seldom that a manufacturer will be found who is unwilling to cooperate with schoolmen to the fullest extent as they plan for their requirements. There are some machine-tool



The above illustration shows a milling machine of the latest design. It serves as a splendid illustration of the advantage of installing new equipment. This machine, although of the No. 2 size, does the work of a No. 3 machine of an obsolete model. Furthermore, it takes up less floor space, and altogether is a better producer and hence a more profitable investment. The job shown is that of milling a gang of six spur gears at the rate of 320 pieces every nine hours. This same machine is installed in the public schools of the city in which this photograph was taken in the manufacturer's plant.

Jobs which at one time or another are handled by a milling machine. Rough forgings of wrenches, micrometers, files, etc., can frequently be obtained and added interest given to the work inasmuch as all parts are familiar to the student.

Selecting the Milling Machine for the School Shop

Questions to be asked before the new milling machine is recommended for purchase:

1. What consideration has been given to the following *safety features* on the machine?
   - (a) Are belts covered?
   - (b) Are there any moving shafts on which clothing can catch?
   - (c) Are clutches covered?
   - (d) Is there a brake making it possible to stop the machine quickly?
   - (e) Is the machine automatically lubricated, protecting against abuse?
   - (f) Are universal joints protected?
   - (g) What other safety features have been included in the design?
2. Does the machine represent the *current model* in use in industrial plants?
   - (a) What is the reputation of the manufacturer?
   - (b) Are the features on the machine up-to-date?
   - (c) How are the feeds changed?
   - (d) How are the speeds made?
   - (e) Which feeds are controlled by power?
   - (f) Which feeds are controlled by hand?
   - (g) How are the reverses made?
   - (h) How is the column constructed?
   - (i) What is the nature of the overarm? Is it easy to move?
   - (j) Where are the starting and stopping levers located?
   - (k) Is it equipped with roller bearings for speed mechanism?
3. What other desirable features does it have?
4. What *cooperation* does the manufacturer give in the use of instruction on this machine?
5. What do *industrial manufacturers* say of this machine?
6. Will manufacturer *supply parts* for use in instruction?
7. Will the manufacturer's *specialist* be present at the opening of bids to explain features and advantages of his machine?
8. What do *other schools* now using this machine have to say about its performance?

manufacturers whose reputation makes it desirable to turn to them for first advice and consideration, although it may be wise to consider *all* makes of tools covering a given machine. There are some manufacturers who have given considerable thought and study to the application of their products in the school field. The needs of the pupils, as well as the problems of the instructor, have received careful consideration and the machine-tool manufacturers are ready with recommendations and assistance *after* the machines are installed, which should not be overlooked.

Features or Talking Points

A salesman may present excellent *talking points*. However, what *you* are interested in, as you consider your new tool is not the question of talking points, but the question of machine *features*. You want to know *why* a feature is placed on the machine. There must be some particular reason why the lever moves in or out, or why the safety device has been added, or why the particular method shown has been used for moving the overarm or table of the machine. Every lever, every control, every feature must justify itself in increased production, in making the machine easier to operate, or safer to run. Consequently, do not be misled by so-called talking points, but give careful consideration to real *productive* features which have a real value for you in your shop and a dollar-and-cents value for the manufacturer in his shop.

Making Your Selection

In the first place, as you consider the installation, let us say of a milling machine, it will pay you to get the literature, specifications, and data from the leading machine-tool manufacturers. Although it is not always necessary, it is frequently desirable to list all of the features which will be found, and to make a tabular comparison of control and of the features mentioned heretofore. It will be found that the specifications of the various machines are frequently identical, but that the method of operating the machine varies decidedly. In addition to specifications you should ask about safety, prices, up-to-date design, reputation of the manufacturer, and of course the various operating features.

Undoubtedly, in your own city there are manufacturing plants using equipment of a similar nature. Ask them what the machines have done for them in actual use. If plants are not located near you, any machine-tool manufacturer will be glad to have you visit him and will have someone delegated to assist you in looking over the particular machine under consideration and your questions will be gladly answered.

The machine-tool manufacturers are particularly eager to have you visit their plants. If the question of installation is not immediate, trips can frequently be worked in during the summer vacation, which will not only prove interesting, but extremely valuable as well.

The method employed in the purchase of machine tools has usually involved the preparation of recommendations by a committee or by individuals familiar with the tool. These recommendations are submitted together with the questions of manufacturing to the board of education or the purchasing committee. Too much emphasis cannot be placed upon the fact that *all* recommendations, and *all* comparisons should be made in as much detail and in as nontechnical language as possible. Frequently members of the purchasing committee have very little conception of the nature of the product under consideration, and therefore must rely upon your recommendations and your analysis.

To assist you in preparing this data in the most concise and logical form, machine-tool manufacturers will usually be glad to have their special representative call on you and assist in the analysis as suggested.

The machine-tool manufacturer should be asked concerning his willingness to cooperate with you, both before and after the machine has been installed. A number of manufacturers have worked out particular instructive shop problems which can be used by the instructor and have seen to it that

the greatest possible service has been rendered by the machine which has been installed. This service should be expected and you will find that it is gladly offered.

What to Expect from Your New Machine-Tool Equipment

Due to the fact that the equipment will probably receive excellent care and attention, you may expect unusually long life. Few, if any, repairs will have to be made. It is recommended that if any repairs are necessary, the manufacturer be consulted. He may desire to have one of his own men make the adjustments and much time and money can be saved even though the initial cost may seem high.

It is not always possible for the machine to handle in your shop, any job that it would handle in an industrial plant. If it is difficult to obtain the work to put on the machine sometimes new work or unfinished parts can be secured from the machine-tool manufacturer.

Go to your local machine shops or go to some industrial plants in a neighboring city, and they will gladly cooperate with you by supplying sufficient castings or parts for use in your instruction to illustrate the various types of machining which can be handled by your particular tool.

Since you are going to keep the machine in excellent shape, you should have an excellent trade-in allowance when you are ready to replace it with a new design, or a current model. Leading technology institutes, such as the Massachusetts Institute of Technology, make it a practice to keep the latest model machine in the lecture room as well as in the shop, and usually they have little difficulty in trading in the older model machine because of the excellent care and attention which has been given to the machine during its use, both in class and in actual work.

Many other factors influence the selection and the installation of a machine tool, but the above points should prove very helpful. If your new machine tool fulfills all of these requirements, you will not go far astray in making the installation.

SCHOOL PRINTING IN THE UNITED STATES

F. C. Lampe, Chicago, Ill.

PRINTING as a school subject has been taught in this country for many years. At the present time there are perhaps four thousand schools—elementary schools, junior high schools, senior high schools, normal schools, vocational schools, colleges, universities, and trade schools—in which courses in printing are offered. Strictly speaking, only the trade schools properly prepare for the trade; while in schools where prevocational and vocational training is carried on a step in that direction is taken. Most public schools which offer printing consider the study as a means toward general education; normal schools and universities generally offer it as a part of teacher training, or as an important part of a course in journalism.

The value of printing for education is generally recognized. Practically every educator, who is at all familiar with the possibilities of a good course in printing, will give testimony to its intrinsic value—in fact, all the schoolmen who have supplied data for the present article and who represent educators in every section of the country have stated that printing is one of the most popular courses the schools offer.

Printing as a study in the elementary and secondary schools had its beginnings in various experiments; its phenomenal growth has come only after a thorough tryout has shown its worth. Not only does printing help the students who actually take the course, but the entire school is benefited by the school printshop. The very fact that schools everywhere are introducing printing courses speaks for the general popularity of the subject.

It may be interesting to read something about early school printing in this country, the reasons why courses were first introduced into public schools and institutions of learning, the aims of the courses, and the various prevailing ideas concerning printing at various significant times.

Preparing Young People for the Trade

In the early period of school printing in the United States, the training was given to lead young people into the trade—to equip them to become skilled craftsmen. In those days young men considered it a great privilege to be taken on as apprentices. No doubt printing was considered then as much of an art as during the years in the early history of printing, about which so much has been written.

The earliest record of school printing has been supplied by Mrs. Nora Fretageot, librarian of the Workingmen's Institute, New Harmony, Indiana. Printing among other industrial activities was taught in the early New Harmony schools. "The Disseminator," which made its first appearance in 1828, was the earliest school newspaper issued, and the printing of it was done by the boys of the school.

Early in 1827 William Maclure, founder of the institute at New Harmony, sent from New Orleans to New Harmony a copperplate printing press for the use of the school. A practical printer and engraver, Cornelius Tiebout, was engaged as teacher. His name will be found in the Appleton "Cyclopedia of American Biography," where one must read New Harmony instead of Kentucky. He died in 1832 in New Harmony, a fact of which the compiler of the cyclopedia was not aware.

On this press, set up in one wing of old Harmony Hall, was begun the printing of "The Disseminator" by the boys of the school. A notice printed in Vol. 1, No. 1, January 16, 1828, reads as follows:

"Edited, printed, and published semi-monthly in the east end of New Harmony Hall, by the pupils of the School of Industry, at one dollar per annum, in advance:

THE DISSEMINATOR
of useful knowledge,
containing hints to the youth of the
United States from the
School of Industry."

Their motto was, "Ignorance is the fruitful cause of human history." Later this was for a time changed to "He who does his best, however little, is always to be distinguished from him who does nothing."

Materials printed were not local news or happenings, but were made up of scientific and educational articles, selected from eastern publications, and articles written by William Maclure, Robert Dale Owen, Frances Wright and others. The object of the paper was to cheaply disseminate knowledge and was in keeping with the ideals of Owen and Maclure for helping the working classes.

In addition to the newspaper, the boys printed, between 1830 and 1838, three volumes of "Maclure's Opinions," the material for which was sent to them by Mr. Maclure from Mexico, where he was living. Many copies of Michaux's "North American Sylvia," the type and plates for which were bought by Maclure in Paris, were also printed. Four hundred

complete copies of this work were destroyed when the Maclure house, in which these books were stored, was burned in 1844. The New Harmony edition of this celebrated work is consequently rare.

In 1830, Thomas Say became head of the printing department and editor of the paper. His "Conchology" appeared first in periodical form and later was assembled into book form. The printing, binding, and illustrations were made in the school printing office. Mrs. Say, who was an artist, designed and hand-colored the engravings made for the book by Mr. Tiebout. It is a beautiful and rare production. Mr. Say died in New Harmony in 1834, and his work was reproduced in 1856 by Binney of Philadelphia. Some Mexican schoolbooks, Spanish catalogs, and other small texts were also printed on this press by the boys.

From some letters of Mme. Fretageot, one of the Pestalozzian teachers and managers of Maclure's business here, written in 1830-31, we glean these facts: "The boys learn to set type very quickly." "Bennett sets type almost as fast as anyone." "The plates to the Sylvia are to be colored by our scholars." "The boys work Sunday and evenings in order to have the Disseminator out on time." At one time she says, "We may hire a printer because our young people cannot do it all." Again, when they are obliged to wait a long time for suitable paper, she says, in her French manner, "I did not think that a work worthy of the perusal of the thinking part of society should have been slighted by an economy of paper." Again, "Maclure wants the Disseminator sent in exchange to all workingmen's papers."

A reference to the same school about which Mme. Fretageot writes has been found by Mr. Charles P. Coates of Los Angeles, California, in the *American Journal of Science and Arts, 1826, 10: pp. 145-50, passim.* This magazine contains a paper entitled "A Short Expose of the 'Improved Pestalozzian System of Education,'" as communicated by Mr. Maclure to "Silliman's Journal," and as practiced by William Phiquepal d'Arusmont and Mme. Fretageot. "The boys learn at least one mechanical art.... By setting types, they practice accurate spelling and become familiar with the construction of all languages which they print, and they can earn their bread in case of necessity."

"Lithography being the best, cheapest, and easiest mode of making accurate representations, as they are in all possible cases substituted for books or descriptions, the pupils are all taught how to design on the stone or cartoons, and how to make the proper ink and pencils as well as all the manipulations of printing and working the press, etc., etc."

SOME EARLY RECORDS OF THE BEGINNINGS OF SCHOOL PRINTING

Woodburn, James A., "Higher Education in Indiana," *"Bureau of Education, Circular of Information,* No. 1, 1891, p. 169, Hanover College, Hanover, Indiana; "While this institution was still an academy, its directors had, in 1829,

VIEW OF THE COMPOSING ROOM IN THE PRINTING DEPARTMENT AT THE GERSTMEYER TECHNICAL HIGH SCHOOL, TERRE HAUTE, IND.

FIRST PRINT SHOP IN SCHOOL NO. 9, INDIANAPOLIS, IND. (PHOTOGRAPH TAKEN IN 1905 BY SUPERVISOR BEN JOHNSON OF SEATTLE, WASH.)

adopted the manual-labour system.... Carpenter, cooper, and wagonmaker shops were erected, and printing presses were obtained."

Letter of President W. A. Millis to Charles P. Coates, February 28, 1924: "I find from the records of the trustees of the institution (Hanover College) that the manual-labour department had been established by them in 1831.... Subsequently, a printing and bookbinding outfit was purchased in Cincinnati and set up at the College. Here books were printed and bound. Likewise a religious paper was published."

Diary and Recollections of Victor Colin Duclos, in *Indiana History Collections:* (Sub.) "Indiana as Seen by Early Travelers; A Collection of Reprints from Books of Travel, Letters and diaries prior to 1830. Edited by Harlow Lindley, Indianapolis, 1916, p. 544. 'In a school superintended by Madam Fretageot (1825-26) painting, drawing, engraving, and typesetting, along with the common branches were taught .... One of our teachers was a copperplate engraver named Tiebout, who instructed the scholars in the art, (p. 546).'"

American Annals of Education, 4:162-65, April, 1834: Quoted in part from the Fourth Annual Report of the Trustees of Lane Seminary, Cincinnati. "In consequence of the contiguity of the Seminary to Cincinnati, printing has been introduced as one branch of labor . . . Booksellers furnished several presses and stereotyped plates for printing some 15,000 copies of Webster's Spelling Book."

(The offspring of the ideology of the Declaration of '76 —I mean, of course, the Speller.)

Fourth Annual Report of the Trustees of Cincinnati-Lane-Seminary: Together with a Catalogue of the Officers and Student Jan., 1834. Lane Seminary: Printed by the Students' Typographical Association MDCCCXXXIV (sic.).

This pamphlet, printed by the students, devotes pp. 8-13 to the manual-labour department, 28 pages in all. Six presses were at work on the "Blue-back Speller," referred to in the first reference as "Webster's Spelling Book." Presses and plates were furnished by Corey and Fairbanks, Cincinnati. The *Elementary Reader* and Dr. Eberle's *Treatise on the Diseases of Children* are mentioned also. Moreover the report itself is referred to with pride as a specimen of the neat work done. The average earnings of students in the printing department are stated as $2.54 a week—a very large earning for manual-labour-school students of the time.

Catalogue of the Students and Officers of Waterville College, Waterville, Maine. For the Academical Year 1836-37, p. 15. College Press, Edgar Gray, Printer, 1836. "There are on the College premises four extensive Work Shops, affording the opportunity for profitable labour for all students in various kinds of woodwork. These contain, also a Printing Office and Printers' Shop."

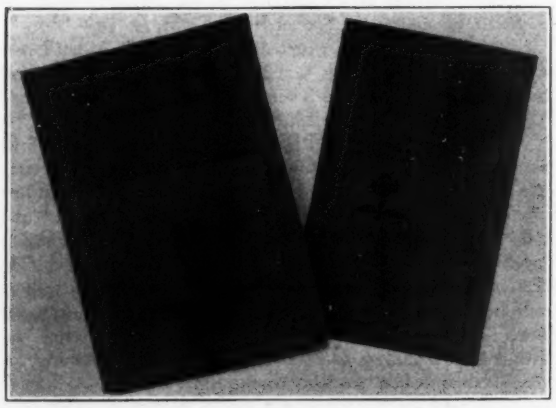
VIEWS OF THE BINDERY AND THE PRESSROOM OF THE PRINTING DEPARTMENT AT THE GERSTMEYER TECHNICAL HIGH SCHOOL, TERRE HAUTE, IND.

Course of Studies, etc. (sic) Bristol Collegiate Institution; Clifton, near Bristol, Pa., 1834, p. 4. "Printing presses, bookbinding, and other profitable and useful kinds of mechanical labour, will employ a large body of the students three hours a day."

Anon., "Intelligence," *American Annals of Education,* 1: 179, April, 1831. Note on a school in Massachusetts in which "the females print a paper." Quoted by the editor of the Annals from the *New York Sentinel.* The editor recommends that "children be taught to spell by being required to set type for books."

The first school printing in North Carolina was done in the State School for the White Deaf at Raleigh, 1857-1865. This institution during those years did most of the state printing. It also printed a few school books for use in the public school and some maps. The course was a trade-training course.

L. A. Roth, instructor of printing in the Minnesota School for the Deaf, Faribault, furnishes interesting data about early school printing. He sent me a reset copy of "The Gopher," Vol. 1, No. 1, dated March 1, 1876, printed in what was then known as the Minnesota Institution for the Deaf and Dumb at Faribault. George Wing was the printing instructor from 1876 to 1881, and was the founder of the first school paper. He imported a small secondhand job press from Boston, and along with the press came a small quantity of secondhand type which was considerably battered. With this outfit Mr. Wing undertook to teach the "art preservative" in the institution. Only two or three boys were taken in at the start. In 1877 the legislature made an appropriation for new equipment and new type. The name of the paper was changed at this time to "The Mute's Companion," and was again changed to "The Companion" in 1887. The school paper is printed biweekly, and contains sixteen pages. The printshop is now well equipped with modern machinery, including cylinder and job presses, linotype and intertype, and the students receive training intended to fit them for the trade. There are twenty-two boys in the shop. They have no difficulty in securing positions at regular journeymen's wages when they have completed their course.



FIRST GRADUATING PROGRAM, PRINTED UNDER DIFFICULTIES BY THE STUDENTS OF SCHOOL NO. 9, INDIANAPOLIS, IN 1910.

Professor Edward S. Meany, of the department of history, University of Washington, Seattle, in his biography of Major Ingraham, published in the Seattle *Post-Intelligencer* in 1915, writing of Major Ingraham's pioneer educational work in 1875 to 1888, said: "He foresaw some of the present vocational ideas and at his own expense installed a $600 printing plant in the high school. It was lost in the Old Central School fire." This was probably the earliest printing which was taught in that state.

In addition to the foregoing, Professor Meany states that missionaries who began their work in the Hawaiian Islands in 1820 looked upon the so-called Whitman Mission (established in the Oregon Country in 1836) as colleagues, and among other gifts sent a printing press to the Columbia River. This was placed at the disposal of Rev. H. H. Spalding, a colleague of Marcus Whitman, who was located at Lapwai, in a part of the old Oregon Country now developed into the state of Idaho. Mr. Spalding printed some hymn books and other pamphlets for educational and religious work among the Nez Perces Indians. This was the first printing of any kind in the Pacific Northwest. The old press is still cherished as a relic at Portland, Oregon, by the Oregon Historical Society.

According to Superintendent Ignatius Bjorlee, of the Maryland State School for the Deaf, Frederick, Md., the first printing equipment was installed there in September, 1878, nearly 50 years ago. Ryne & Ricketts, Baltimore type founders, furnished the outfit, which consisted of the bare necessities for hand setting of type, a small job press, stands and cases, approximate cost being $500. The superintendent at that time was Charles W. Ely and printing instructor was George William Veditz. Additions have been made to this outfit by installing a cylinder press and two linotype machines. There are fifteen boys now taking printing. Printing is taught as a trade subject. The students furnish the printing needed for the school, but they do not enter into commercial printing of any sort. Mr. Veditz, the first printing instructor, is still interested in the progress made in this school and frequently corresponds with Superintendent Bjorlee.

(To be Continued.)

INDUSTRIAL ARTS IN A TOWN OF THE FAR NORTHWEST

Melvin H. Frack, Ferndale, Wash.

The present article has been written in the hope that some opinions may be forthcoming on the development and results of industrial arts in the rural high schools of the country.

Ferndale is a small town of 900 inhabitants. It has a high school built in 1914, which draws a large percentage of its enrollment from the surrounding country. It is a strictly farming community in which the occupations of dairying, general farming, poultry raising, horticulture, and sugar-beet raising are carried on.

Agriculture is taught quite completely but because of the diversified industries of the community, it is difficult to develop to any great extent, one or more types of industries in the school shop. The aim has not been to develop tradesmen for any particular trade. The town is close to several medium-sized cities and in every case large woodworking plants have been established within their limits. In a number of cases, senior boys have been placed in woodworking and cabinet shops.

The industrial arts building was erected with the idea that simple woodwork and geometrical problems in drawing are all that could be well mastered in the vocational line. The aim was to make the department a neat and efficient plant.

The building is 36 feet by 48 feet and two stories high, with a machine room at one end 18 feet by 36 feet. The shop has sixteen single work benches, with storage space and one large drawer. Each bench is equipped with a rapid-acting vise and common bench tools. Benches and tools have been numbered from one to sixteen and the same plan has been carried out with the boys who work during each period. The benches are well placed for good light and space. A close system of checking for tools has been adopted which makes each student responsible for his own equipment and for the general care of shop property. Each article of equipment has a place and is returned at the close of the class period. A tool cabinet is centrally located in the shop and a glue place and clamps are found in one corner. A finishing room has been added at one end of the shop. It is 22 feet by 32 feet and is equipped with cabinets for finishing supplies.

On the second floor, there is a drafting room, with twenty single-drawer type of enameled top tables. Cabinets for drawers are arranged along the wall. The tables accommodate seven drawing boards each and are provided with lights. There is also a small library in which are found the latest books and material on the subjects taught. A small blue print room and office are also given space on this floor.

The machine room has a circular saw, a six-inch jointer, and two wood lathes. A large portion of the improvements were made during the last year since it took a year to plan and arrange the changes and improvements demanded.

The changes in the shop and drawing courses have been made as a result of a study of local conditions and a survey of the probable occupations of the students:

Woodworking Courses:

1. Household mechanics (first year), required.
2. Elementary woodwork (second year).
3. Cabinet work (third and fourth years).
4. Turning (second, third, and fourth years).
5. Carpentry (second, third, and fourth years).
6. Advanced carpentry (third and fourth years).

Drawing Courses:

1. Elementary mechanical drawing.
2. Mechanical drawing.
3. Furniture drafting and designing.
4. Freehand sketching and drawing of objects to be turned.
5. Elementary architectural drafting.
6. Advanced architectural drafting.

One-half year of shop and drawing work is required in each of the subjects covered.

Cabinet work has been stressed a great deal, but it is believed that where a student makes a careful study of utility, workmanship, design, finish, and beauty in the project he constructs, he has received some benefit which is not to be found in books. During the summer months the boys are frequently employed around the school plant in the construction and repair of school furniture.

In the direction of community work, the farm shop classes perform special jobs for the farmer who is in need of some repair work, or who wants to erect a farm building. In such cases, all the work is done in the school shop.

The woodworking classes also take orders for special jobs from the surrounding country such as the repairing of furniture and construction of furniture to suit special rooms. A number of jobs have been completed for local business men the past year. During the school term, a number of production jobs have been completed for the school department. In this work, factory methods are used whenever possible. The boys also have built a number of pieces of furniture for the new American Legion home, and street markers for all streets were made in the school shop.

The need for architectural drafting and carpentry arose last year and there was an increased interest in the poultry industry.

A survey of the quantity and quality of the types of building in dairying and poultry raising has been made. As a result, several plans of dairy barns, poultry houses, and garages have been drafted.

During the coming school year it is planned to develop the idea of small models for practical training in the fundamentals of building construction.

INTERESTING EXHIBIT OF WORK DONE BY STUDENTS IN THE MANUAL TRAINING DEPARTMENT OF THE PUBLIC SCHOOLS, FERNDALE, WASHINGTON, UNDER THE DIRECTION OF MR. M. H. FRACK, INSTRUCTOR.

INDUSTRIAL-ARTS MAGAZINE

E. J. Lake S. J. Vaughn
Editors

VALUES NOT MEASURED IN MONEY

For the last quarter of a century, and especially for the last decade, the chief concern with reference to almost any proposition was indicated by such questions as, "How much does it cost?" "What is it worth?" "How much do I get out of it?" Music, art, literature, and science have been looked upon quite generally as a means of making a living and getting money.

So much has been thought and said about art in terms of money and position, that people sometimes forget that for the vast body of our people art can never be a means of holding a position or getting a living. For the most of us, whatever we get or have of art is simply in the nature of an appreciation—the ability to select what pleases and satisfies us in the realm of beauty. Someone has said that "art is the achievement of beauty." This is a good definition from the standpoint of one who does artwork, who really participates in the fascinating work of creating beauty. But for the most of us art is not the *achievement*, it is the *appreciation* of it. Many an art critic, and multitudes of art lovers could never produce a work of art.

More and more the necessity becomes apparent for serious and painstaking study and work in our schools looking wholly to the matter of making appreciative and artistic homemakers and citizens. In so far as the actual execution of artwork will promote understanding and appreciation of art, it could be carried forward to the point of appreciation of basic principles.

Too much of the artwork in our schools is devoted entirely to the execution and productive side and not nearly enough to the study of examples of artwork already produced. It's the consumer's need and the layman's point of view that demand a great deal more attention than they are now getting.

SELF-APPRAISAL

One of the most important things in the guidance and advisement work is the encouragement of the individual to undertake a self-analysis. The difficulty of such task is in getting the individual to understand what to look for and how to identify and classify it after it has been discovered.

Perhaps not too much time has been devoted by teachers to the analyzing of their students, but certainly too little attention has been given to the necessity of each individual's self-appraisal.

What shall the individual look for? Too much effort has been unwisely spent on trying to discover general powers. Let it be understood that powers reveal themselves usually if not always in response to specific demands, specific needs, and specific interests. Therefore, the quest for powers or capacities should be undertaken in direct connection with specific objectives. The individual must be induced to test himself in terms of the desirable and necessary characteristics called for by certain specific occupations in which he may find a strong interest.

It is a fine method to ask the student to select his ideal person in a certain occupation or business—one who typifies to the student the highest ideal of that occupation. The student should then be asked to list the various characteristics this ideal person possesses that make him the ideal of his particular business, occupation, or profession. Having listed the qualities of his ideal, the student should then be asked to compare his own qualities of mind, his own personality, his own physical fitness, his own aptitudes, his own power of self-control, his own strength of character, etc., with those attributed to his ideal person in the particular calling under discussion. For other occupations, the same method may be pursued until the student has compared himself in all essential matters with his selected ideal in each of the occupations. While the comparison will be inaccurate, it will usually not be an overestimation of the student's own abilities. Large experience reveals that the student earnestly seeking assistance will tend to undervalue his own capacities in comparing them with those of his selected ideals.

As is well known, this method was quite extensively used in the Army in judging officers for promotion, except that the appraisal was made by an officer of considerably higher rank than that of the officer being judged for promotion. The judge's ideal officer would be set up as a standard. His qualities that made him the ideal officer were listed. Then the officer being judged or tested would be compared in terms of these qualities with the ideal officer set up by the judging officer. It was quite a common thing for officers seeking promotion to subject themselves to the ordeal of self-appraisal according to this plan. No one but an egotist would give himself an overrating.

The reaction of such an appraisal on the individual making it is always a most wholesome one. When he finds by his own appraisal what his own strength and his own weaknesses are, he can set himself definitely to the task of strengthening his weaknesses, changing hurtful habits and attitudes, forming new habits and attitudes, using wasted time, modifying his disposition, and generally check up on himself with a view to self-improvement. All the guidance and advice in the world will avail nothing unless they bring the individual to the point of self-study with a view to self-correction.

ECONOMY IN THE SCHOOL

The present-day tendencies toward mass production, turning waste materials into by-products, cutting down overhead expense, and the eternal cry of efficiency, behooves us all to be alert to the possibilities in our departments.

School executives, many times, bent upon lower cost of administration, advocate economy and become a bore to those directly affected in the classroom. Too many times it is a case of living down to a budget instead of real economy.

Whenever instruction or the course of study is not hampered by a change of system resulting in economy, the change is justified and highly desirable. The cost of supplies, maintenance of equipment, and the utilization of all the resources at our command to set the example of economy in our school systems, are matters which should receive the hearty support of all engaged in the education of youth.

Our pupils will eventually be part of life—industrial, commercial, or professional, and will sooner or later be forced to fit into the schemes of economy which result in increased production, lower prices to the consumer, and a more contented and wealthier society.

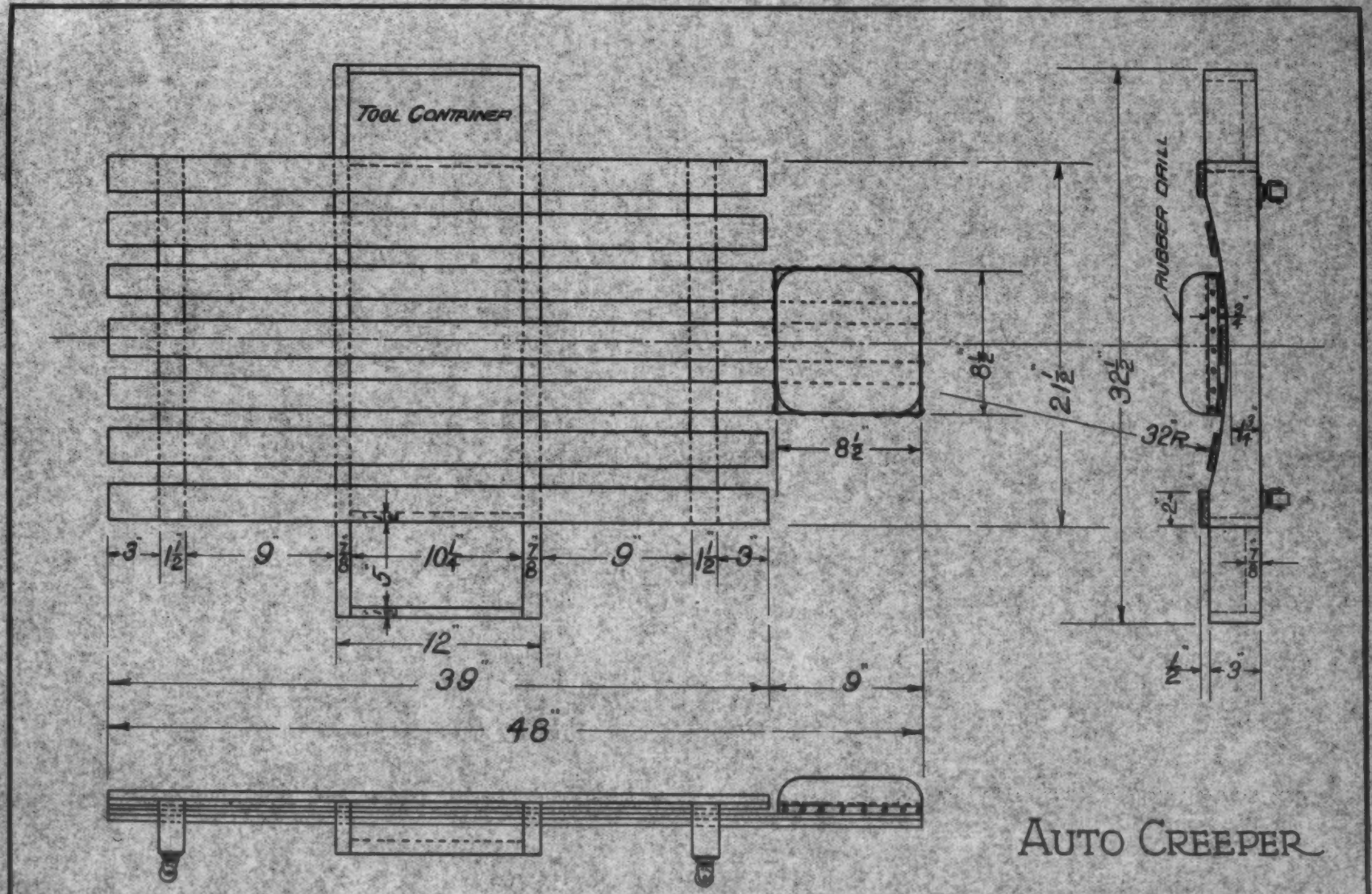
In the formulative period of development, when basic ideas are becoming an integral part of the lives of our students, it is our plain duty to set the best examples of economy of time, effort, and materials. Efficiency in thought, word, and deed should be our watchword.

No matter how small the saving might appear, we must not lose sight of the fact that in the realm of industry, the saving of a much smaller amount, multiplied by many thousands, due to production on a large scale, will result in a tremendous saving over a period of time.

To be blueprinted for School Shop Use Only
© 1927, The Bruce Publishing Co.

THE INDUSTRIAL ARTS MAGAZINE
MAY, 1927

To be blueprinted for School Shop Use Only.
© 1927, The Bruce Publishing Co.



AUTO CREEPER

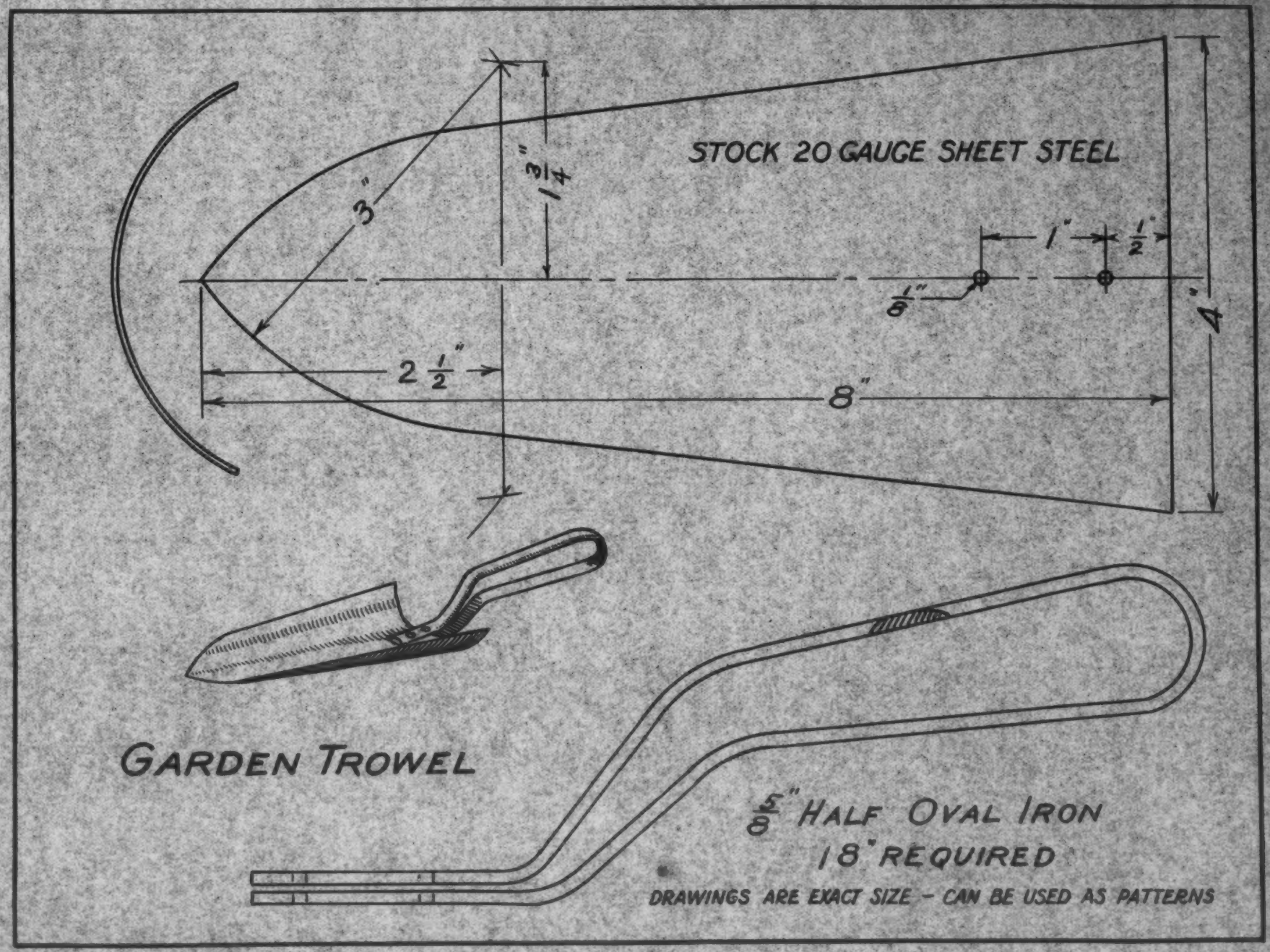
E. C. HOUSTON,
ZANESVILLE, O.

Designed by E. C. Houston, Zanesville, Ohio.

For Details see Page 197, Industrial-Arts Magazine, May, 1927.

To be Displayed for School Shop Use Only.
© 1977 The Press Syndicate.

MAY, 1977
THE INDUSTRIAL-ARTS MAGAZINE



GARDEN TROWEL

5/8" HALF OVAL IRON
18" REQUIRED

DRAWINGS ARE EXACT SIZE – CAN BE USED AS PATTERNS

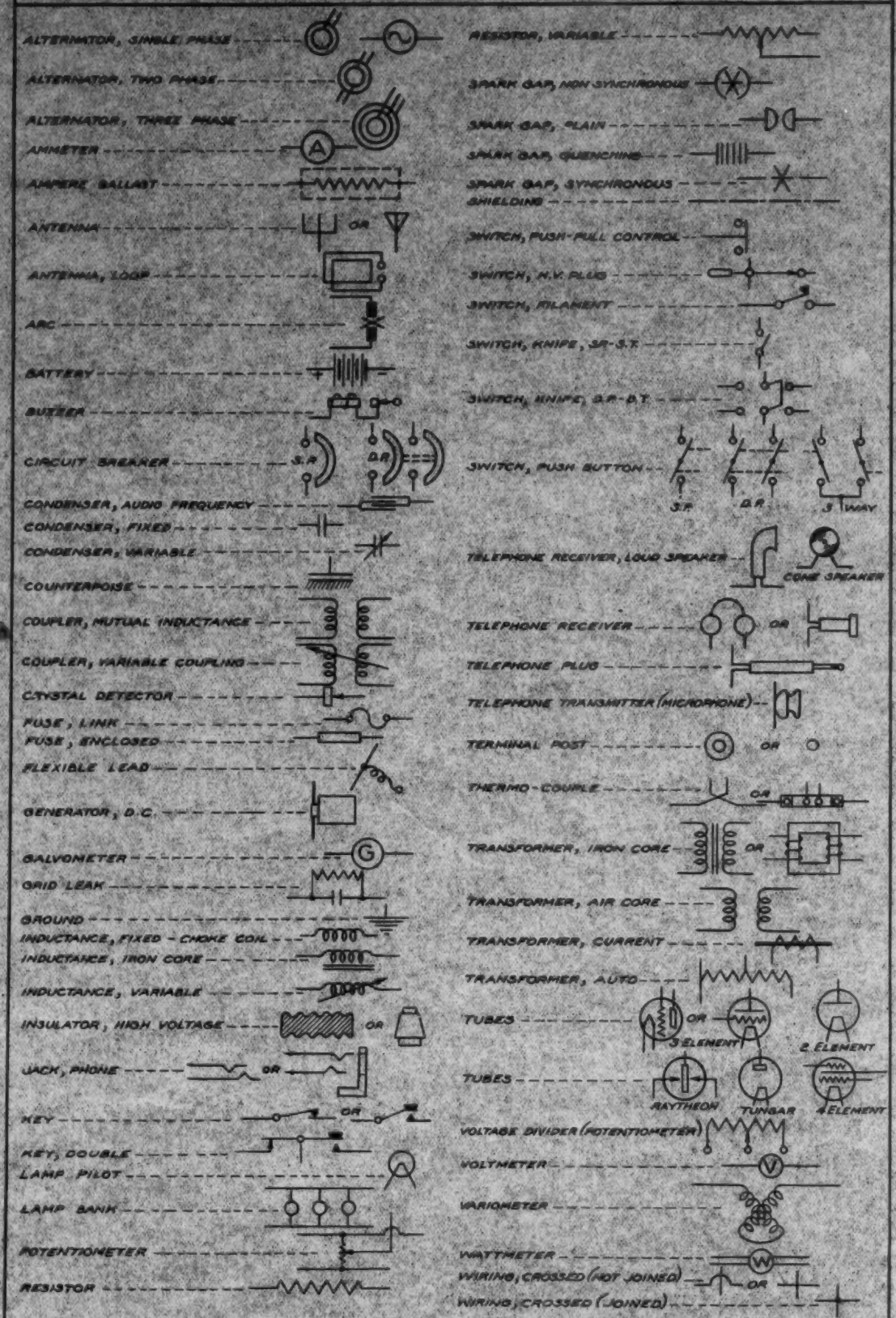
Designed by G. G. Greene, Lane Technical High School, Chicago, Ill.

For Details see Page 198, Industrial-Arts Magazine, May, 1927.

TRACING SUPPLEMENT No. 56.
THE INDUSTRIAL ARTS MAGAZINE,
MAY, 1927.

To be Reprinted for School Shop Use Only
© 1927, The Bruce Publishing Co.

CHART OF STANDARD RADIO SYMBOLS ---- JOHN F. FABER

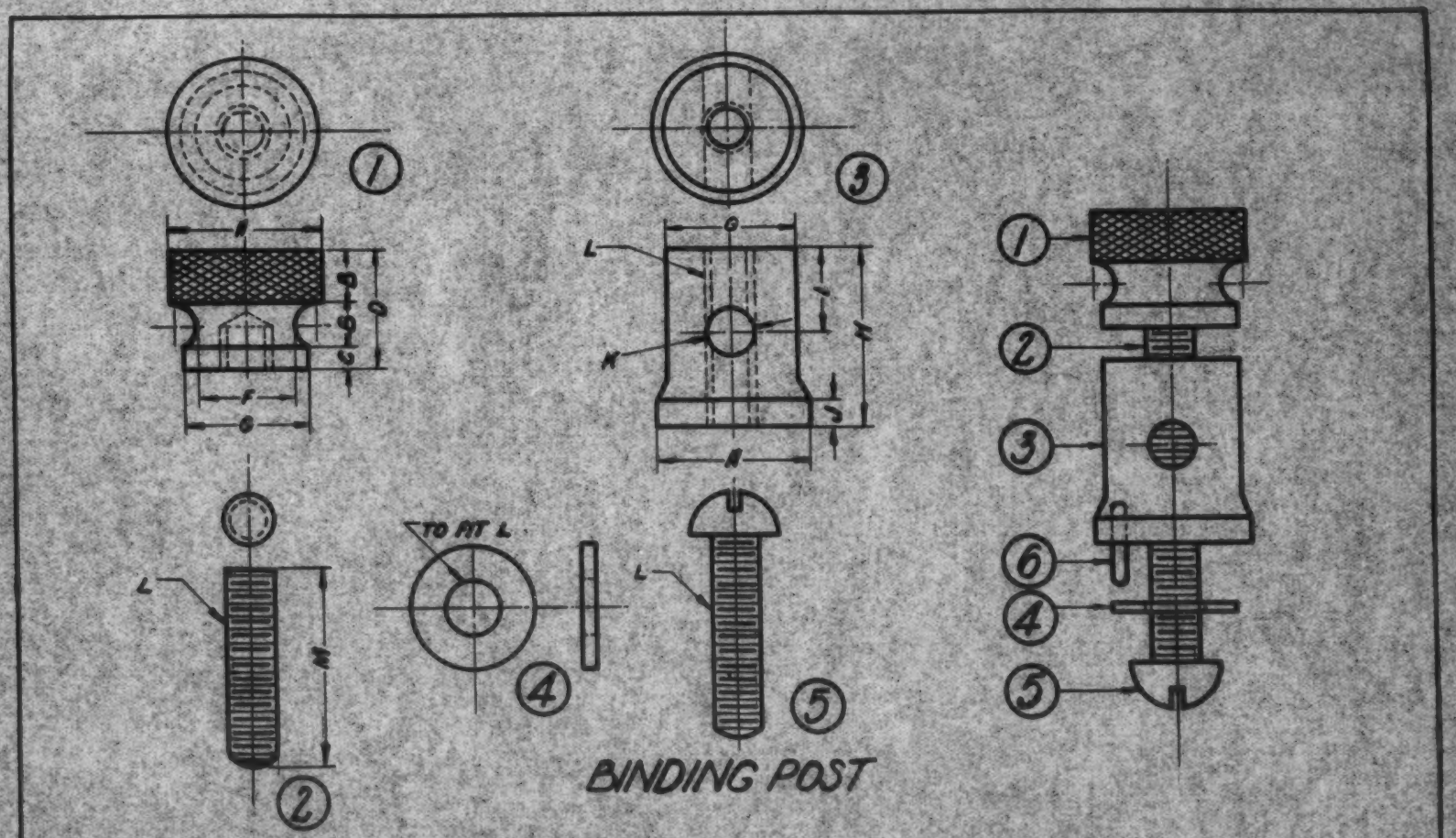


Designed by John F. Faber, Erie, Pa.

For Details see Page 198, Industrial-Arts Magazine, May, 1927.

© 1927, The Bruce Publishing Co.
THE INDUSTRIAL ARTS MAGAZINE
MAY, 1927.

© 1927, The Bruce Publishing Co.



A	B	C	D	E	F	G	H	I	J	K	L	M
3/8	1/8	1/16	5/16	5/32	1/4	5/16	1/2	1/4	1/16	1/8	6-32	7/16
1/2	5/32	3/32	13/32	3/16	9/32	7/16	5/8	5/16	1/8	5/32	8-32	9/16
5/8	3/16	1/8	1/2	1/4	5/16	1/2	3/4	3/8	3/16	3/16	10-24	5/8

NO.	NAME	QTY.	MAT'L	REMARKS
1	CAP	1	BRASS	SWEAT #2 INTO #1
2	CAP SCR	1	BRASS	CUT FROM STOCK
3	BASE	1	BRASS	
4	WASHER	1	BRASS	STOCK
5	SCREW	1	BRASS	STOCK
6	PIN	1	BRASS	MAY BE ADDED ON 5/8 SIZE

Designed by H. D. Campbell, Oak Park, Ill.

For Details see Page 188, Industrial-Arts Magazine, May, 1927

UNIVERSITY OF CALIFORNIA
SAN DIEGO
LIBRARY

In the shop we must aim at good habit formation, for habits *are* being formed, and unless directed along the lines of economy and efficiency, our product (the student) will be handicapped for a time, until he has adjusted himself to the actual conditions of industrial life.

Economy, therefore, is a worthy aim of education; not as we are sometimes led to believe, a whim of the school board. It should be encouraged and originated in the school shop and the classroom, and not be painfully inflicted through executives.

ENCOURAGING PROGRESS

Only a few years ago, it was common to hear school teachers referred to by business and professional men as "those impractical schoolmen." Those of us who have for a quarter of a century been connected with the industrial and vocational education movement realize how difficult the task has been to inspire the so-called "hard-headed business man" with confidence in the school teacher when business, administration, and other very practical considerations were involved.

Although business men for the most part started the agitation for the practical forms of education and financed the movement, they turned quite naturally to people outside of the teaching profession in an attempt to get leaders. They even argued that men outside of the teaching business would have to do the teaching. They little realized that teaching of itself is an art very difficult to acquire. After much experimentation and worry and failure, not only was the teaching finally left for *teachers* to do, but the industries and business enterprises themselves turned to schoolmen to head up their educational and training work.

What a change in attitude has now come about! Where once it was almost impossible to get any considerable number of business and professional men to attend a conference with schoolmen on the questions of industrial and vocational training, it is now quite common to find such conferences very largely attended by business men, professional men, foremen, shop superintendents, personnel managers, and all grades and kinds of school teachers. Only recently in a western state, the railroad men of every line of work had a week's conference. The program was quite well divided among practical shop men, superintendents, and vocational-education directors and teachers. Each had a contribution to make and every man listened attentively and respectfully to what the others had to say. The railway conference was typical of numerous such conferences being held in the various industries. No one is shut out. Every person is welcome who has a point of view to present or a contribution of any kind to make. By such confidence and cooperation, there is no limit to what may be accomplished in the years just ahead for industrial and vocational education.

THE REAL JOY IN MANUAL TRAINING

"Most of the fun in manual training," writes Thomas R. Foulkes, instructor at Desplaines, Ill. "is gained from the planning and figuring out of what to make, and how to do it. The boy who accepts a completed blue print and set of instructions from the teacher is missing the real joy which he should feel in doing the job. If the boy has his work planned for him in detail by the instructor there is danger of his becoming simply a follower of directions. He is just a laborer doing all the hard work, while the instructor has had the most pleasurable and interesting part of the whole job—planning the design and the construction.

"If the instructor turns the completed blue print and specifications over to his boys, he is giving them the straw to work with, so to speak, after he has threshed out the kernels of wheat and put them away in the cupboard where the boys cannot damage them.

"The reason for this is that the real *thrill* comes from the *joy of creating* something ourselves, and consists in the accomplishing of the job rather than the accomplishment. That is, our main objective is not the treasure chest or radio table we are making but (1) *the training* we give ourselves in *thinking the job through*, and (2) the joy we have in planning it, thinking out every detail before we start to work, then actually making our dream *a reality*—in other words, *creating* something. The boy who has missed the joy of *creating* something has a real thrill in store for himself. And the 'kick' one gets from it may be greater each time he creates a better project than ever before.

"How proud we are when we take the completed job home and say, 'This is *my* work, and the teacher didn't plan it for me either!' "

BUILDING PATHS

Laurence Parker, Kansas State Teachers College, Pittsburg, Kans.

Dr. Tee and his good wife had invited us to their cottage at the lake for the week-end. "Where is the doctor?" we asked our hostess, as she welcomed us upon our arrival. "He is down at the beach, building a path over the rocks," she said. We were surprised and said that we had not heard that they had bought the cottage. "O, no, we haven't bought here and don't expect to, but you know how Dr. Tee is about fixing things up."

Sure enough, we found our host busily engaged in building a path which would make the trip of bathers over the gravel beach from the cottage to the water, a more comfortable one.

The time of year is coming when you manual-training men will have a chance to be like Dr. Tee, if you only will. Perhaps your names are on file with a teachers' agency, and you are expecting to move out of your manual-training shop and to enter another shop in a different part of the state. It is up to you right now to decide whether or not you will leave a comfortable path for the feet of your successor. It is true, that the man you succeeded last year left no such path for you, but try as an experiment, following the example of Dr. Tee.

There are various ways of building a path for your successor. You can, for instance, leave for him the course of study which you started to work out and which is only partly finished. It may be that he will not want to use it all. He may not use any of it, but you will have done your part when you have given him the benefit of your experience in the community. He may be mighty grateful to have it as a rule and guide during these first few months.

Of course, we all know that the stockroom and the tools should be left in good condition, but we also realize that the word "good" is a relative term. Your predecessor may have thought he left them in good condition. It may be that you were sure the tools were at "sixes and sevens" when you came; but remember how you felt, and help the new man over this rough spot. Of course, there must be a resemblance of order if you are to get the last check, but do better than that.

Think back over what a dickens of a time you had getting together a list of materials that you thought you would need the first year on the job. Leave behind you for the new man, a list of material used during the past year. Of course, the new man may not thank you for it, but you will have done your part.

It is such things as these that will build a path for the comfort of the feet of the stranger who, next year, will tackle the job that you are leaving. It is just barely possible the man you are to succeed will see this article in THE INDUSTRIAL-ARTS MAGAZINE, and do as well by you. Here is hoping that building such paths becomes a custom and a habit.

Recent government statistics note that 884,000 students in this country are taking vocational courses. In 1918, the number was 164,000.

DISCIPLINE AND CONDUCT IN THE SCHOOL SHOP

R. F. Troge, San Diego, Calif.

There is a difference between the problems of discipline and conduct which confronts the industrial-arts teacher and those which must be met by the teacher of academic subjects.

First, let us consider the discipline side of it. The shop differs from the classroom. Conditions affecting both mind and body are different. The type of work is different. Consequently there must be some difference in the standard of discipline.

At one time I visited a shop in which the teacher was using, or at least attempting to use, the same standard in the shop as was used in the classroom. Making a study of this problem at the time, I tried to find out as nearly as possible whether or not he was meeting with success. I learned from good authority that his success, if you could call it such, lay mostly along the line of discipline, since this required a good share of the time which ordinarily should have been spent in instruction. The boys dreaded going to this shop and went there in about the same frame of mind and with as much enthusiasm they would ordinarily have on the way to a dentist's office to have a tooth extracted. We know that if the boy's interest is not in his work, that work cannot result in the finest success.

I have also seen several classes in which the pupils were allowed to do what they had a mind to, so long as the building was left intact and the tools were somewhere in the shop at the close of the period.

These happen to be two extreme cases; nevertheless conditions like these do exist and the latter is more numerous than the former. If the problem of discipline is solved in the grades and junior high school, the problem in the senior high school will be greatly minimized or cease to exist at all.

This is no attempt to solve the problem or set a rigid standard for such would be practically impossible. Too many things enter in, such as the shop itself, working conditions, the sufficiency of the tools and material, and last but not least the method of instruction and the instructor himself.

Most industrial-arts teachers are unanimous in the opinion that discipline in a school shop should be as nearly as possible similar to the conditions as they exist in a well managed commercial shop. Those of us who have had such trade experience (which includes practically all), know that this means the students must be "on the job" and "hitting the ball." Such a situation does not permit loafing nor does it require (on the part of the boy), permission from the instructor for every move he makes about the shop.

Giving the boy some responsibility toward the upkeep and management of the shop, and working with the instructor rather than for him, cause problems of discipline to disappear. Another great factor, if not the most important in removing opportunities for disciplinary problems to spring forth, is a well defined course of study and conditions such that the course may be followed, and clear and concise directions on the new problems and tool processes the boy is about to undertake. The boy then knows what is expected of him and goes to his work confident that he can successfully do that which is before him. This not only turns out satisfactory projects but automatically dispenses with the majority of disciplinary problems.

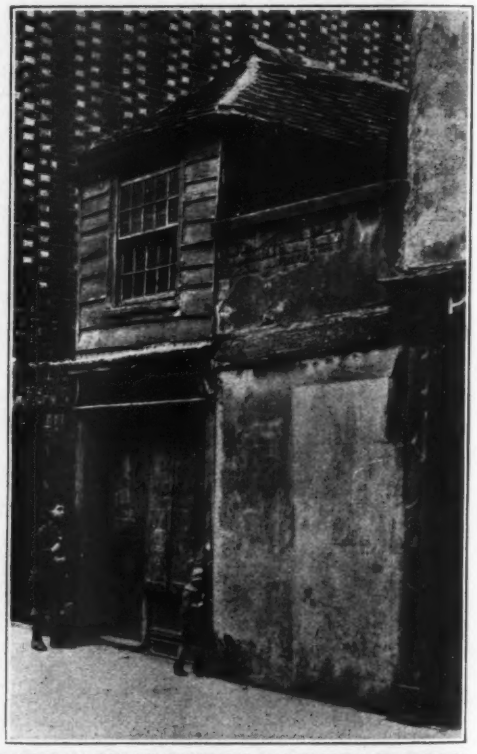
It has already been mentioned that the boys should work with their instructor rather than for him. First of all, respect and courtesy on the part of the boys should be insisted upon by the instructor at all times. I have seen classes so conducted that little respect was shown for the instructor. The boys would wear their hats and caps about the shop with no thought of removing them. The blame could not be placed on the boys, for the instructor made no protest whatever against such conduct. Undoubtedly some will say, "Wearing of hats and caps has nothing to do with class instruction." This is true so far as it goes, but we must not forget the fact that the boy is not in school for class instruction alone, and especially is this true of the junior high school. Why instructors consider it legitimate for their pupils to come and work all period without removing their hats and caps when the instructor himself would not think of instructing the class wearing his hat, is more than I can answer. If it is necessary because of the nature of the boy's work that his head be covered, then it certainly should also be necessary that his clothing have similar protection. In such cases sufficient aprons and shop caps should be required for the individual boys to use. This will do away with the nondescript clothing which in many instances makes a class appear as a lost battalion of "Coxey's army," but will also go a long way toward improved workmanship.

We know that disrespectful conduct on the part of the boy is not tolerated in the academic, often referred to as "high brow" classes. I want the boys to be just as "high brow" when they are in my shop as they are in their academic classes. If we are to be examples before our pupils of what is right and proper (and this is expected of a teacher), why not insist that the pupil try to follow that example, especially when it requires such little effort?

Summing up, we find that the standard of discipline in the shop must necessarily differ from that in the academic classroom, but the conduct never.

It is well to recall the words of William L. Hunter, instructor in manual arts at the University of Iowa:

"You as a teacher must show him the way,
Make the boy work, but don't let him play;
Encourage his interest and 'ginger' and 'pep,'
But let him know, too, that he must—keep in step."



WHERE ENGLISH INDUSTRIAL EDUCATION WAS BORN.

Industrial Education in England dates back to John Pounds, who was born toward the end of the seventeenth century and died in 1732. John Pounds' house in Portsmouth, England, illustrated above, is still standing and is pointed to with pride by Englishmen as the home of the first industrial school. Pounds was a poor cobbler, who saw ragged children growing up about him without education and without an opportunity in life. There were few elementary schools and no compulsory school laws, and it required money to attend school and acquire knowledge. Pounds gathered the children of the neighborhood in the evenings and Sundays and taught them to use their hands and to read. Out of his efforts grew the "ragged school movement," which was the beginning of present-day industrial education in Britain.

ORNAMENTAL CONCRETE BIRD BATH

H. P. Gerber, Director Department Industrial Arts, Northern State Teachers' College, Aberdeen, South Dakota

Ornamental concrete as a shop subject requires only a small working space and can be carried on with inexpensive equipment at very low cost.

After teaching this subject for a number of years, I find that the direct gain to the student from such a course may be divided into three main heads:

1—The handling of concrete.

2—The design.

3—Carpentry or woodwork experience, gained in the construction of forms.

Before attempting a problem of this nature, the student should familiarize himself with the use of concrete in connection with simpler projects, such as flower boxes or small water troughs, in order to acquaint himself with the various possibilities as well as the difficulties encountered.

In designing a project of any consequence it is best to first draw many small sketches until a desired shape is evolved. Then a full-size drawing should be made and the forms built accordingly.

A standard molding book with full-size drawings of moldings is very valuable in this connection.

One important point to remember is that all moldings, panels, etc., designed to leave a depression in the finished cast must have sufficient draft, or clearance, in order to facilitate easy removal of forms from the green concrete, which will crumble easily under very slight pressure. It must also be borne in mind that wooden forms will absorb some moisture, which causes swelling and adds to the difficulty of removing forms.

All molds or forms should be made with butt joints at the corners, and the four sides joined with wood screws or clamps. Several coats of paint are applied and a thin coat of one part lubricating oil and two parts kerosene is spread on the inside previous to filling. Moldings are usually fitted by cutting mitres at the corners. White-pine lumber is best to use.

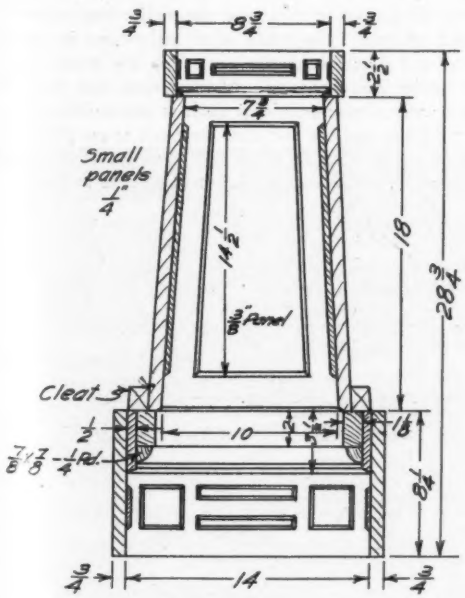
COMPLETED BIRD BATH IN USE ON THE COLLEGE CAMPUS. FIVE OF THESE ARE NOW BEING USED TO BEAUTIFY THE COLLEGE GROUNDS.

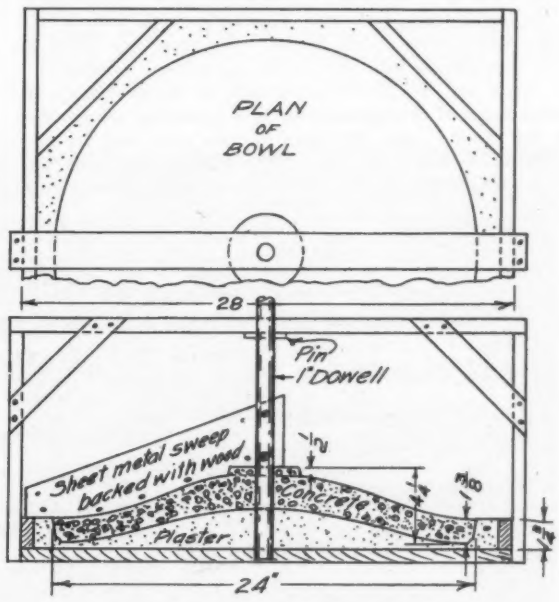
Plaster Form for Bowl

The framework or support for the plaster form is made of waste lumber, as none of this wood will touch the finished concrete. A 1" dowel rod, or broomstick, is carefully centered in holes in the floor boards and top cross member. A sheet-metal sweep is cut to fit a full-size pattern for the inside of the bowl. This is backed with a piece of 1" wood and both are screwed to the dowel at the proper place.

Plaster of Paris is then mixed in a pail by adding gradually to water and stirring rapidly until it becomes creamy.

MOULDS FOR CONCRETE BIRD BATH





The mixture is then poured into the rough board form while the sweep is moved around. The form need not be poured all at once, but can be made in several batches as the joints will be smoothed out by the sweep. When the plaster has dried a day or two it should be shelled, painted, and oiled.

Placing Concrete

The mixture for the bowl should be one part cement to two parts screened sand, mixed thoroughly, and very little water added, in order to form a stiff mixture that can be tamped into place. The mold is filled and tamped higher than is necessary in order to form the proper shape with a second sweep which is made from the full-size pattern as indicated by the drawing.

The pedestal form is also inverted for filling. The mixture used is a one-to-three proportion of the same materials. In this piece a quaky consistency is used and forced into all parts of the mold by tamping or jarring. Regular Portland or Atlas white may be used.

In 24 to 48 hours the forms may be removed and the pieces carefully packed in wet sand for a week or more to thoroughly season them. The two parts are not joined until they are set up in a permanent place.

BIRD BATH AND FORMS USED.

To join, spread a rich cement mortar on the top of the pedestal, place the bowl on this, level, and smooth up the joint with a pointing trowel. The hole left in the bowl by the dowel, which should be removed as soon as the concrete is placed, may now be filled with mortar.

Bird baths of this type are ornamental, as well as useful, if they are kept filled with water.

CUTLERY FOR THE PUBLIC-SCHOOL FORGE SHOP

Jay F. Knowlton, Supervisor Boys' Industrial Work, Hibbing, Minn.

THE HISTORY OF KNIVES forms a very interesting chapter in the progress of civilization. From the time prehistoric man used his teeth to cut his food, to the present day with its high-class cutlery, one can read chapter upon chapter of interesting history. The first knives of which we have a record were from flint, and, no doubt, were useful in spite of their crudeness. It is a large cry from flint knives to present-day surgical instruments which must be so keen as to pass through a leather testing drum by their own weight. The findings of archaeologists at Tutankamen's tomb in Egypt prove that six thousand years ago man made knives of flint so sharp that he could shave with them. These "razors" were of the safety-blade type and, apparently were held in the fingers which served as the holder. No record was found to prove that shaving with such knives was entirely painless.

Space will not permit us to trace the knife through its several stages of development, but it is interesting to note that the first cutting edges developed by man were used for protection and as aids in the hunt. Man learned at an early date that a severe interruption of the circulatory system of an animal causes death, and developed various forms of spears, arrows, and knives. The object of these implements was to pierce with as little effort as possible, and it is therefore not surprising that they were made long, thin, and narrow. These shapes have always been of interest and one can notice that some of the first steel knives, the daggers, follow these shapes.

The dagger illustrated in Figure 1 was made in the author's classes. While this dagger was largely made to teach the history of the art of knife-making, it still is of some value in the farm home. Hunters find it of some use also as a sticking knife. The shape of the sticking knife was undoubtedly first developed because of its simplicity in character and due to the fact that it follows the earlier implements of defense and offense. The knife is of little value in cutting material as the point is in the center of the blade, which makes it receive all the wear. Neither does this shape of knife work well as a slicer. This fault is due to the lack of curve of the blade and the fact that the point is too prominent and is likely to be effective when only a stroke of the blade proper is desired. The sticking knife illustrated in Figure 2,

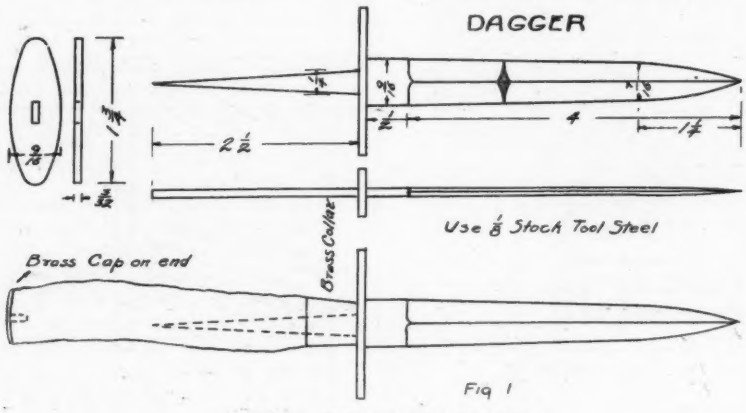


FIGURE 1. DETAILS OF A DAGGER.

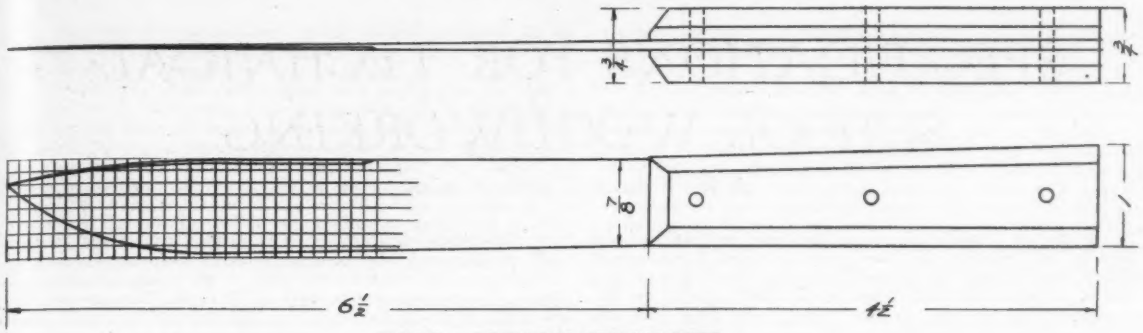


FIGURE 2. DETAILS OF STICKING KNIFE.

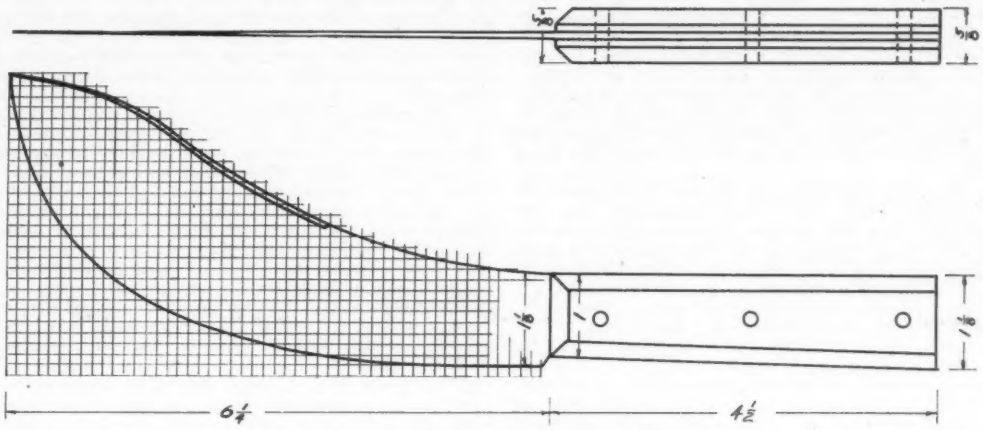


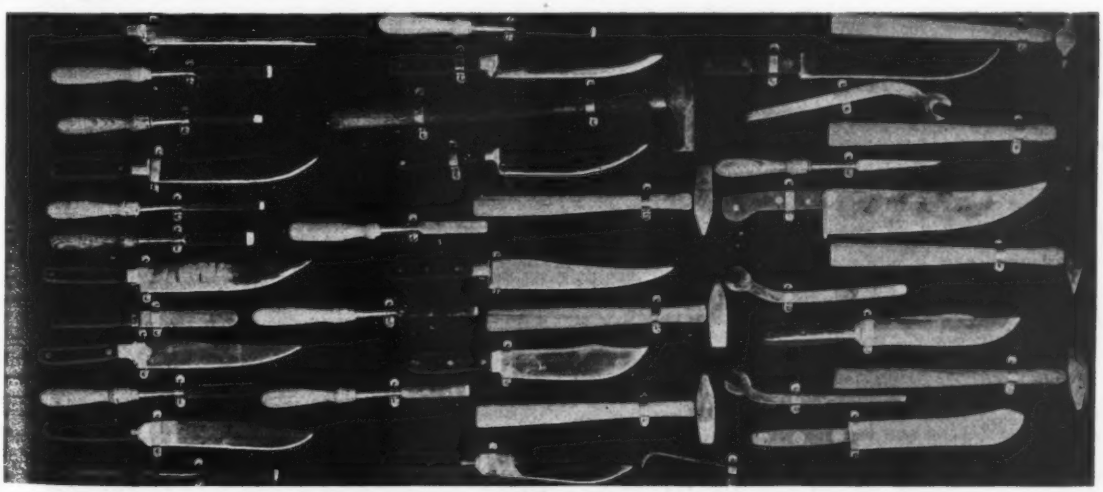
FIGURE 3. DETAILS OF SKINNING KNIFE.

like the dagger in Figure 1, is not generally used as a household instrument.

The Turks were the first people to see the value of curved blades, and perhaps they carried the idea to the extreme. The Turkish sword is so strongly curved that the point loses its place of importance. The Turks no doubt saw that in close quarters and against implements shorter than their own the curved blade delivered a harder blow and cut more easily than straight blades. In kitchen knives of the present day we find the curved blade carried to the extreme of effectiveness in a knife like that shown in Figure 3. This is one form of the present-day skinning knife and is excellent for its purpose. Other skinning knives have a slightly different shape and a little less curvature, but in all knives used for this general purpose the point has not been developed.

The sticking knife and the skinning knife are the two extreme types now commonly used. All other patterns seem to be the result of attempts to combine features of these two types. The result is that we have various curved blades with more or less sharp points adapted to various uses. It is to be regretted that space will not permit a further discussion of the development and the history of the knife and of the first types found among various parts of the world, among primitive as well as civilized people. The main purpose of this paper is to explain the methods which the author has found successful in the making of knives in the forge shops of public schools. From this point the paper will proceed to discuss the materials and the making of practical knives.

(To be Continued.)



SOME CUTLERY AND TOOLS MADE IN THE AUTHOR'S SHOP.

SPECIFICATIONS FOR TECHNICAL-SCHOOL WOODWORKING

A. W. Williams, Toronto, Canada

The city of Toronto has one of the finest equipped technical schools on the continent, and three years ago found it necessary to establish a branch school to take care of students who find it too long a journey to reach the parent school in the central part of the city. In equipping and operating the main school, many things have been learned regarding the installation and equipment of machinery. The experiences thus gained by the staff and the shop director are shown in the requirements drawn up for the woodworking machinery for the new branch, known as the Riverdale Branch. While the equipment installed is not nearly as complete as in the central school, it is considered ample for present requirements. The details are as follows:

Guards for Machinery. The machinery supplied to the school is guarded in the most thorough manner possible, and the guards furnished have been subjected to the approval of the advisory industrial committee. The guards in every case do not interfere with the use of the machines.

Motors and Their Equipment. In the case of all motors, the requirements of the Toronto Hydro-Electric Commission have been fully complied with as to dust protection and other forms of guard. The setting up of the machines has not included the fastening of the floor, the erection of countershafts, or the connection of wires to the circuits in the building unless specifically called for in the tender.

The Lathes. Eighteen woodturning lathes with a swing of 12" have been installed. One of these lathes has a bed 7' long, and the balance are 4' long, with a length over the half couplings at each end of not more than 5'.

The machines are of neat, modern design, carrying a line shaft in high-grade ball bearings at each leg, projecting at each end, and carrying suitable flexible couplings. (The machines have been placed in a line, with a shaft underneath so that all the machines may be driven from a motor at the end of the shaft.)

The lathes are placed end to end, about 12" apart, and the couplings permit of slight play due to imperfect alignment without noise, on a shaft running at 720 r.p.m. The bearings for the line shaft are capable of both horizontal and vertical adjustment for bringing one shaft in line with the next. The spindle bearings have oil reservoirs and are self-oiling and dustproof. The couplings are capable of transmitting 6 h.p. to provide for a momentary heavy load and the manufacturer has guaranteed noiseless action of the coupling.

The shafts are lined up on the lathe so that no further adjustment is necessary, and to secure this the bottom of the legs have been machined. The leg under the headstock is wide enough to protect the students' clothes from contact with cones and belts, and the shaft is enclosed in a metal tube for safety. The top of the bed, the front and back upper edges, and the inside upper edges (between which the tailstock slides) are machined and in line with the spindles.

All the lathes are made with interchangeable parts, and face plates, chucks, and couplings are a good fit on any of the lathes. The spindle has a hole a little more than ½" right through it and a No. 2 Morse taper; the tail center is of the same taper. The lathe has carefully balanced four-step cones and the speeds of the spindle are in the neighborhood of 700, 1,100, 1,800, and 2,800 r.p.m. All tightening or clamping on the toolrest and the tailstock is done by permanent handles or wheels so that wrenches are not required for the purpose.

The headstock is covered by a case over the belt so that with the wide leg previously mentioned, all parts are protected. A brake for quickly stopping the lathe is provided.

The equipment includes for each lathe: One belt, 1½", stretched before gluing and made endless; one faceplate, 6" in diameter; one rosette chuck, or screw chuck, 4" in diameter, threaded for the spindle nose; one hollow cast-iron chuck, 3" inside and with a hole right through; one hollow cast-iron chuck, 2" inside and with a hole right through; one spur center 1" in diameter; one cup center; one toolrest 12" long; one 6" toolrest; one wooden toolshelf fastened to the back by iron brackets and level with the lathe shears; a knockout rod for removing the head centers and provided with hooks on each lathe at the head end where they hang.

And in addition to the individual equipment the following have been provided: Two angle rests, two faceplates, 10" in diameter; two cone centers; six bent-bar wrenches of tool steel to fit the flat sides of the faceplates and chucks. All faceplates and chuck hubs have two flat sides for easy removal with the bar wrench.

All shafts have complete coupling fitted to the shaft, so that the shafts are all ready to couple other lathes on the end at any time in the future.

The motors were supplied under another contract, but six extra half couplings and other necessary parts were supplied by the lathe manufacturer and fitted for the shaft of the motors and other machines. The motors run at a speed of 725 r.p.m. There are two complete sets of dimensioned blue prints supplied with the lathes. These blue prints are used for the instruction of students on the construction of the machines.

Bandsaws. Three bandsaws 18" including the following equipment for each saw: Highest grade of ball bearings for upper and lower wheels; roller guides above and below the table; two saws ⅜", brazed, swaged and filed; a suitable 550-volt, 25-cycle, 3-phase induction motor.

The motor is 1 h.p. at 40° C. rating (a motor 20 per cent larger at 50° C. would serve). In addition to the individual equipment, there is one extra set of bearing sleeves furnished for the motors.

Mortisers. Three vertical hollow-chisel mortisers have been provided. Each is equipped with foot-lever feed suitable for chisels up to ¼", with plain table and provision for holding the work from rising with the chisel, and each machine has spring stops for duplicate work, four hollow chisels, and bits $\frac{5}{16}$".

These machines have 550-volt, 25-cycle, 3-phase induction motor. A motor starting switch for low voltage and overload relay is provided complete with push-button automatic start and stop, and remote control, enclosed in a dustproof case which can be locked.

Belt Sanders. The belt sander is a high-grade machine with two pedestals, connected by a bottom plate, and having a rolling table with a capacity of 8' in length and 54" in height above the table. This machine is equipped with two fine garnet paper belts 6" wide; two coarse garnet paper belts 6" wide; pulleys 6½" wide; a spring arm for taking up the slack when working on curved work; a 550-volt, 25-cycle, 3-phase induction motor. The motor is 5 h.p. at 40° C. rating.

Saw Table. There are three iron-frame tilting-top saw tables with frame cast in one piece, with iron throat plates having finger hole for lifting, and full equipment, including the following for each machine; accurate ripping gauge, two miter and crosscut gauges, two ripsaws with swaged teeth, two cleaner-tooth miter saws, conical arbor bushing for centering saws with large hole.

All parts of the machine are guarded. The guards for the saws include a splitter fastened to the part of the frame which carries the saw and also a hood which is fastened to the splitter and easily adjusted. All three machines are supplied with 550-volt, 25-cycle, 3-phase induction motors.

One iron frame tilting-top saw table is provided. It has the fence cast in one piece, with throat plates having a finger hole for lifting, and a specially rigid table and ripping fence, which has a suitable support opposite the saw. This machine is used principally for ripping. In addition to the ripping fence there are two miter and crosscut gauges, two ripsaws with swaged teeth, two cleaner-tooth miter saws, a conical arbor bushing for centering the saws with large holes, and ball-bearing spindle.

All moving parts are guarded. The guards for the saws include a splitter fastened to the part of the frame which carries the saw, and an easily adjusted hood attached to the splitter. This machine is supplied with a 550-volt, 25-cycle, 3-phase induction motor, and a starting switch having a low voltage and overload relay complete with push-button automatic start and stop with remote control, and enclosed in a dustproof locking case.

The motors are 5 h.p. for the heavy variety saw and 3 h.p. for each of the other three saws, and are rated at 40° C.

The shop includes one rigid iron-frame, cut-off saw table with an accurate rolling table 6' long and equipped with four roll-over stops on a graduated gauge the full length of this table; also, a roller stop clamped to the graduated edge of a stationary iron table. The long gauge on the roller table has an extension to reach the other side of the saw for pushing the part cut off past the saw. Two cleaner-tooth hollow-ground miter saws accompany the machine.

There are also provided a 550-volt, 25-cycle, 3-phase induction motor with a starting switch having a low voltage and overload relay complete with push-button automatic start and stop, and remote control, enclosed in a lockable dustproof case. The push button is located at the most convenient position in front of the machine.

The motor is of the 3 h.p. type, and with provision for tightening the belt. Necessary arrangements have been made so that a dust-collecting hood may be readily attached. All parts are carefully guarded. The guards include a splitter fastened to the frame carrying

the saw, and an approved hood guard fastened preferably to the splitter. The main frame which carries the saw arbor is in one piece and the machine is capable of very accurate work.

Shaper. One single-spindle shaper with accurate cast-iron table is included in the equipment. This is a machine of the highest grade and has ball bearings capable of operating under constant full load at least 7,000 r.p.m. without trouble. It has complete equipment and an accurately made fence with springs for holding the work on the table and against the fence. The outfeeding end of the fence is capable of ready adjustment in an exact line with the edge of the cutter and the infeeding end of the adjustment parallel with the outfeeding, but farther back to allow for the depth of the cut. This fence is used for jointing and matching and acts the same as the tables on a hand jointer.

A 550-volt, 25-cycle, 3-phase induction motor is furnished. The motor is 3 h.p. at 40° C. rating, is belted up, and has provision for tightening the belt. The machine is fully guarded including the belts, and the cutter guards have received special attention. These are fastened to the table or frame of the machine, are handy to use, and effective.

The Jointer. The 8" hand jointer is of heavy and most accurate construction, equipped with a round safety cylinder and high-speed steel knives, and with adjusting screws for setting the knives. The head is of solid form with grooves cut for receiving the knives. One extra set of high-speed steel knives is furnished in addition to the set in the head. The machine is equipped with ball bearings so arranged as not to interfere with rabbeting. The table is arranged for rabbeting. There is a tilting fence, and steel lips on the edges of the tables.

A 550-volt, 25-cycle, 3-phase induction motor is furnished and wired up with a starting switch having a low voltage and overload relay, complete with automatic start and stop, remote control, and enclosed in a locking dustproof case. The motor is a 3 h.p. at 40° C. and is installed in accordance with the regulations of the Toronto Hydro-Electric Commission. The machine is provided with a motor bracket. There is provision for holding each knife accurately to the proper position for grinding. All parts of the machine are guarded in the most thorough manner.

The guard for the cutter head moves to one side when the work is being dressed on edge and returns by a spring when the work has passed; it automatically rises to permit the passing of work being dressed on the fence. Necessary arrangements are made so that a dust-collecting hood may be readily attached.

Bench Jointers. Three 4" bench jointers are installed. These are equipped with round safety head and high-speed steel knives, ball bearings, a tilting fence, and steel lips on the edges of the tables. The round head is of solid construction with grooves cut out for receiving the knives. A suitable 550-volt, 25-cycle, 3-phase induction motor is furnished. All parts of the machine and motor are fully guarded.

Cabinet Planer. One 24" planer of the cabinet type is provided. It is of the heaviest construction, capable of producing a smooth surface on cross-grained wood without any ridge at the ends. The machine is equipped with round head, with four high-speed steel knives, and with adjusting screws for setting the knives. These heads are of the solid form, with grooves cut out for receiving the knives.

There are also furnished one extra set of high-speed steel knives, in addition to the set in the head, one gauge for setting the knives, a sectional roll and sectional chip breaker. All feed rolls are power driven. The sections are 3" long. The machine has two feeds without the removal of any pulleys, and the highest grade of ball bearings on the cylinder shaft.

The motor is a 550-volt, 25-cycle, 3-phase induction type, with automatic starter having a low voltage and overload relay. The motor is a 10 h.p. type, and is supplied with covers as required by the Toronto Hydro regulations.

The machine is furnished with a motor bracket. A motor knife grinder, 115 volts a. c., capable of grinding both the back and front edges of the knives in place is furnished with the machine. It has a substantial cord and push plug attached to a light socket and is of such a nature that it may be used on the jointer. Provision is made for holding each knife accurately in position for grinding. All belts, gears, infeeding rolls, and other parts of the machine are guarded in the most thorough manner.

Water Tool Grinders. The shop has three water tool grinders on a heavy floor stand, with 12" by 2" wheels, and with substantial self-oiling, dustproof bearings. The wheels have a plentiful supply of water when running but do not stand in water while at rest. The wheels are very soft, about grade H Alundum or R Aloxite, and with a grain of thirty or a mixture of thirty and finer. These machines have an approved tool rest for grinding woodworking tools, which tilts to any required angle and is readily adjusted and securely held; the edge of the rest is close to the wheel.

The tool rest and pan have been so arranged that a tool at least 16" long may be ground with an angle of about 15° without allowing the water to drip outside the pan.

The machines do not require a countershaft but are driven from a shaft near the floor, which runs at about 720 r.p.m., and which is from 7½" to 10½" above the floor. The form selected is one with two wheels outside the bearing and the pulley between the bearings, with a shaft below to adjust the height for coupling to the line shaft, and a suitable pulley for giving a speed of about 4,000 feet per minute to the wheel spindle. This pulley is easily accessible.

VACATION STATIONERY

Margaret Fullerton

Special stationery is a very useful, interesting, and inexpensive addition to anyone's vacation equipment. The young couple driving through to spend the season at one of the National Parks, the trio of college girls who are hiking overland to a summer camp, the family with a Ford which is taking them to visit grandma, are all going to write letters. And those who have packed up for a long permanent camp, or are spending their vacation at home, are likely (or at least are expected) to write more.

Hotels, clubs, and steamship lines furnish stationery which guests eagerly use to tell their friends just where they are and what they are doing. But what of the vacationers whose writing mood comes over them when they are a hundred miles away from any such supply? Letter writing is always easier if the proper materials are at hand, and it becomes even more certain that all the promised letters will be sent if there is, all ready and waiting, paper whose letterhead was designed especially for the person who is to use it, and for the place where that person is to be.

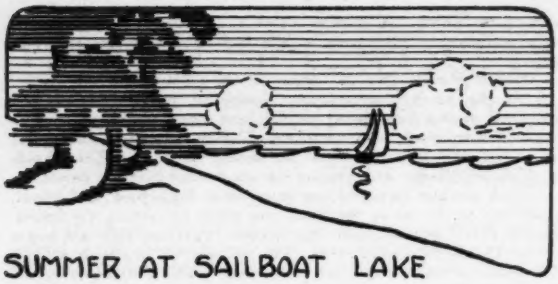
The designs given illustrate letterheads for several types of users. The "Summer at Sailboat Lake" is for the family with a cottage at the lake. The "Q's" spent the summer "Seeing America first" and their stationery is suitable for any location between the two oceans. As "Timberline Camp" is a permanent camp, the address is given along with the name and the sketch of the snow-capped peak which rises in the background. The couple whose note paper shows their little car on the trail, are off for the summer, camping each night wherever sunset overtakes them.

These are but suggestions to show that for those who are traveling, the design will depend upon the route, the method of travel, and the personnel of the party; while the design used for a permanent location can usually incorporate some special characteristic of the place. Perhaps this will be some little detail such as the crude windlass which was rigged up last summer to bring the water from the lake up to the platform on the cliff, or the open porch where breakfast is always served on sunny mornings. In fact, if the design is not based upon some such detail, there is no particular preference between it and a syndicate letterhead cut.

The letterhead design should first be worked out with pencil upon common drawing paper, and then traced in India ink upon tracing paper or cloth. It may be drawn and inked upon white drawing paper or bristol board, but the use of the tracing paper or cloth is just as satisfactory from the standpoint of the cut maker and is somewhat simpler from that of the designer.

Designs are usually made several times as large as the cut is to be, as this simplifies the drawing and causes minor inaccuracies to disappear during the process of reduction.

The cut maker can reduce or enlarge a drawing to any size desired, but cannot change its proportions, hence the design should always be drawn with the space upon which it is to be printed, in



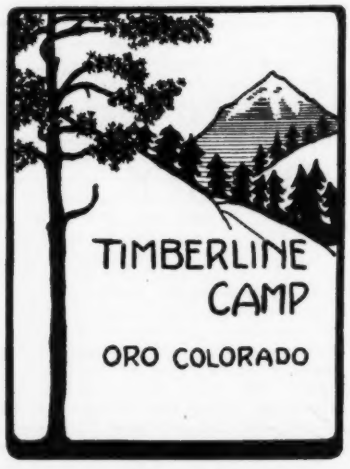
mind. For instance, the design for the camp in the Colorado Rockies, and the one with the roadster on the trail might appropriately be made about an inch high and printed near the top of the paper either in the middle or near the left side. The cut for the design "Auto Bumming with the Q's" was intended to go clear across the paper near the top, the right and left ends of the sketch corresponding with the margins left in writing below it. The designs may be hand lettered, or space may be left within which the printer can set up job type of any desired face.

The designs shown can also be cut in linoleum or wood, or still better in the new rubber blocks which are just coming on the market. In a sense, such a hand-cut block is more suitable for a vacation letterhead because the materials are inexpensive, readily prepared, and quite expressive of a temporary, informal, and unconventional trip to the country or the mountains.

The school printshop will find vacation stationery a splendid problem for the closing weeks of the school year when there is no time for a big job, but work is needed to keep the shop busy and the boys interested.

Much of the charm of vacation stationery depends upon using paper which harmonizes with the design in size, texture, and color.

Printers usually carry in stock "legal size" paper (8½" by 13"), "letterhead size" (8½" by 11"), and a smaller note size (7¼" by 10½"). This last is a good size for vacation stationery because it is large enough to furnish space for a letterhead of convenient dimensions for typewriting, and yet small enough to be acceptable as personal rather than business stationery. The printer can cut his large sheets into other sizes, or can print the design so that the paper may be used as a folder instead of as a sheet. However, before deciding upon some unusual measurements, it is well to make sure that envelopes of satisfactory shape are available. Stationery stores carry in regular stock, envelopes for each of the standard sizes given above.



It is more economical to use paper which can be purchased by the pound instead of that which comes in fancy boxes. Many different grades of white paper, and usually gray, blue, and tan, may be purchased in large quantities.

White paper of a medium weight is always in good taste, and is best to use whenever there is any doubt of obtaining colored paper which will exactly fit the requirements, and be harmonious with the spirit of the design. However, it is possible to produce much more artistic effects if one has an opportunity to choose paper whose texture and color are especially appropriate for the design in question. For example, a paper of rough texture in mixed browns and grays is much more in keeping with the cactus design which would probably be used on paper for a cattle ranch on the mesas of Arizona, than a shell-white paper with glazed surface. Before getting too far away from a comparatively smooth surface, consider how well the paper is suited to showing up a small design printed with fine lines. Paper which has a rough mat surface or loose threads will not print as well as a smooth variety. There are on the market several grades of paper which although smooth on the writing face, have deckled edges which supply the look of informality which is much to be desired in vacation stationery.

Printing the design in more than one color is possible, but not at all necessary, even if it is desired to have a combination of tints. One satisfactory way of introducing additional hues is by using water colors. Some designs are best printed in a darker shade of the color of the paper, with the lettering printed over it in a still darker shade or in black. For instance, the lettering might have been left off of the sketch of the "Auto Bumming" design, while the mountains, plains, cities, and oceans were printed in sepia on a light tan paper. The inscription could have been printed over the sketch in dark brown or black. For designs such as the "Timberline Camp," the printer can use a tint block the size of the design and print the zinc plate over this in a different color. This makes a contrast between the background of the picture and the paper color.

Color combinations for the designs given, are suggested as follows:

Summer at Sailboat Lake: Design printed in dark green upon a very light green paper. Dark blue or black design printed upon gray paper.

Bumming with the Q's: Brown design printed upon tan paper. Blue or brown design upon white or buff paper. Blue or black design upon gray. Dark green upon gray or upon light gray-green.

Timberline Camp: Dark brown design printed upon light brown paper. Black design printed over a tint block of yellow upon buff paper. Design in blue or black over a tint block of orange, upon gray paper. Design in dark blue-green over a tint block of light green-blue upon white, gray, or gray-green paper. Violet-blue design over a tint block of lighter blue, upon gray paper.

On the Trail: Dark brown design printed upon light brown paper. Black or blue design upon gray paper.

BOOKBINDING CLASS AT THE VOCATIONAL SCHOOL FOR BOYS, NEW YORK, N. Y.

PROBLEMS & PROJECTS

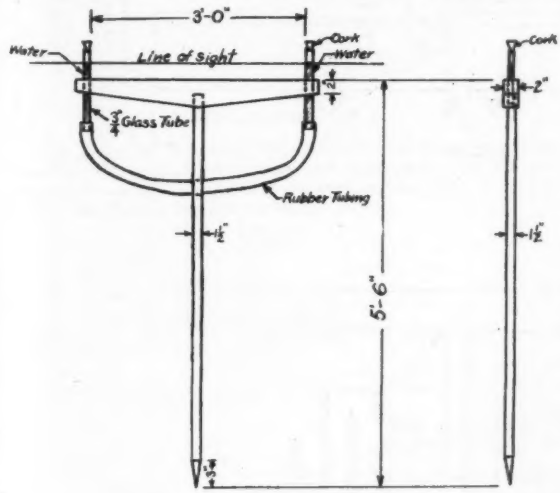
This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

FARM WATER LEVEL

Fred Short, Barron, Wis.

This instrument is constructed on the principle that "water seeks its own level." The glass tubes are set in the crossarm through holes bored vertically through it. They are connected at the bottom with a rubber tube. They are then filled with water to within about two



DETAILS OF FARM WATER LEVEL.

inches of the top. When in use the corks should be removed and the vertical stake placed in the ground as nearly plumb as possible. The line of sight is then obtained by sighting from the water level in one tube to the water level in the other and thence to a rod and target for a foresight or a back sight as the case may be.

If the water is colored red by the addition of a little household dye or other coloring compound it will facilitate the operation of the instrument.

A HOUSE NUMBER

F. L. Reynolds, Salina, Kans.

This project has been rather popular in the grade schools. The frame and numerals are cut out of wood with the coping saw. The numerals are mounted on black screen wire, which is tacked to the back of the frame. The edges of the wire are covered with a very light molding.

The number is hung from the porch soffit in front of the porch light, which makes the number visible at night. In the daytime, the black screen, practically invisible in the shadow of the porch roof, makes the number stand out clearly in relief.

The design may be varied to suit the taste of the prospective owner. Usually the frame measures 6" x 12". The numerals are from 3" to 3½" high. The entire sign is painted to match the house on which it is to be hung.

A LESSON IN MAGNETISM

John J. McSweeney, Boston, Mass.

I have found by an experience of several years that one of the most difficult lessons "to put over" in electrical work is that concerning the general laws of magnetism. To overcome lack of interest on the part of the boys and to motivate the lesson properly in accordance with present day theories, I developed the following experiment which has made it much more interesting:

Experiment on Magnetism

Material Needed:

Tin pan. (This may be made in the sheet-metal class.)
Iron filings.
Paraffine wax.
Coarse paper.
Tweezers.
Tea or coffee strainer.
Alcohol lamp.
Stand for pan.
Two bar magnets.

Procedure: Put the paraffine in the pan and place the pan on the stand. Ignite the alcohol lamp and place under the pan of wax. Place the north pole of one magnet about half an inch from the north pole of the other magnet. Holding the piece of paper with the tweezers, dip it into the melted wax and place it over the magnets, then sprinkle the iron filings over the paper before the wax solidifies. Coarse paper is very good for this experiment as the melted wax penetrates it more thoroughly and therefore holds the iron filings to the paper much more firmly. This part of the experiment is a practical demonstration, with proof, that like poles repel. Repeating this experiment with a north and south pole near each other, we have another sheet of iron filings proving that unlike poles attract. These two sheets may be made by every student and filed away in a notebook.

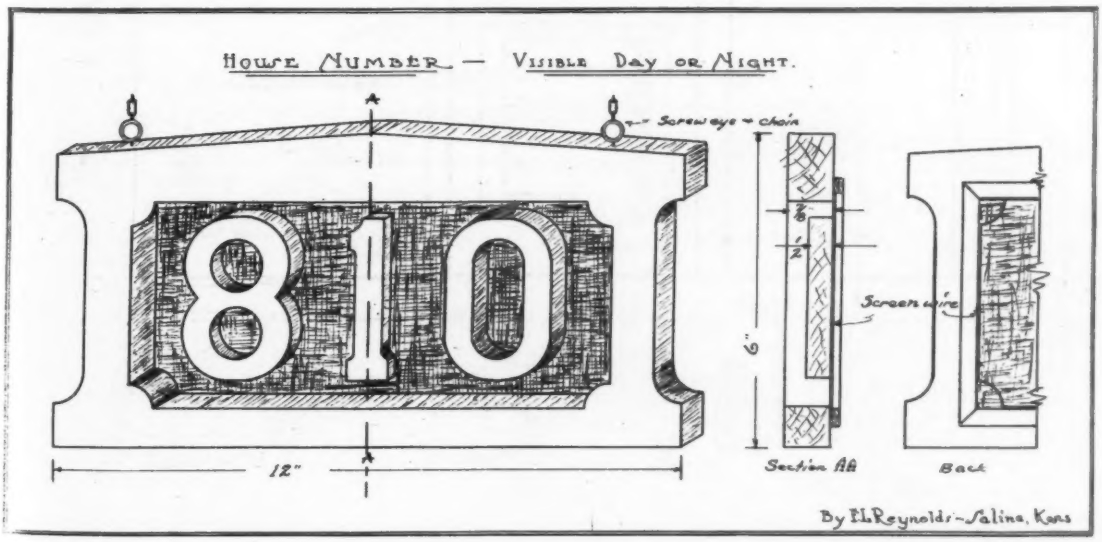
Results: A clear picture of the magnetic lines of force; of the magnetic field. Proof that like poles repel and unlike poles attract.

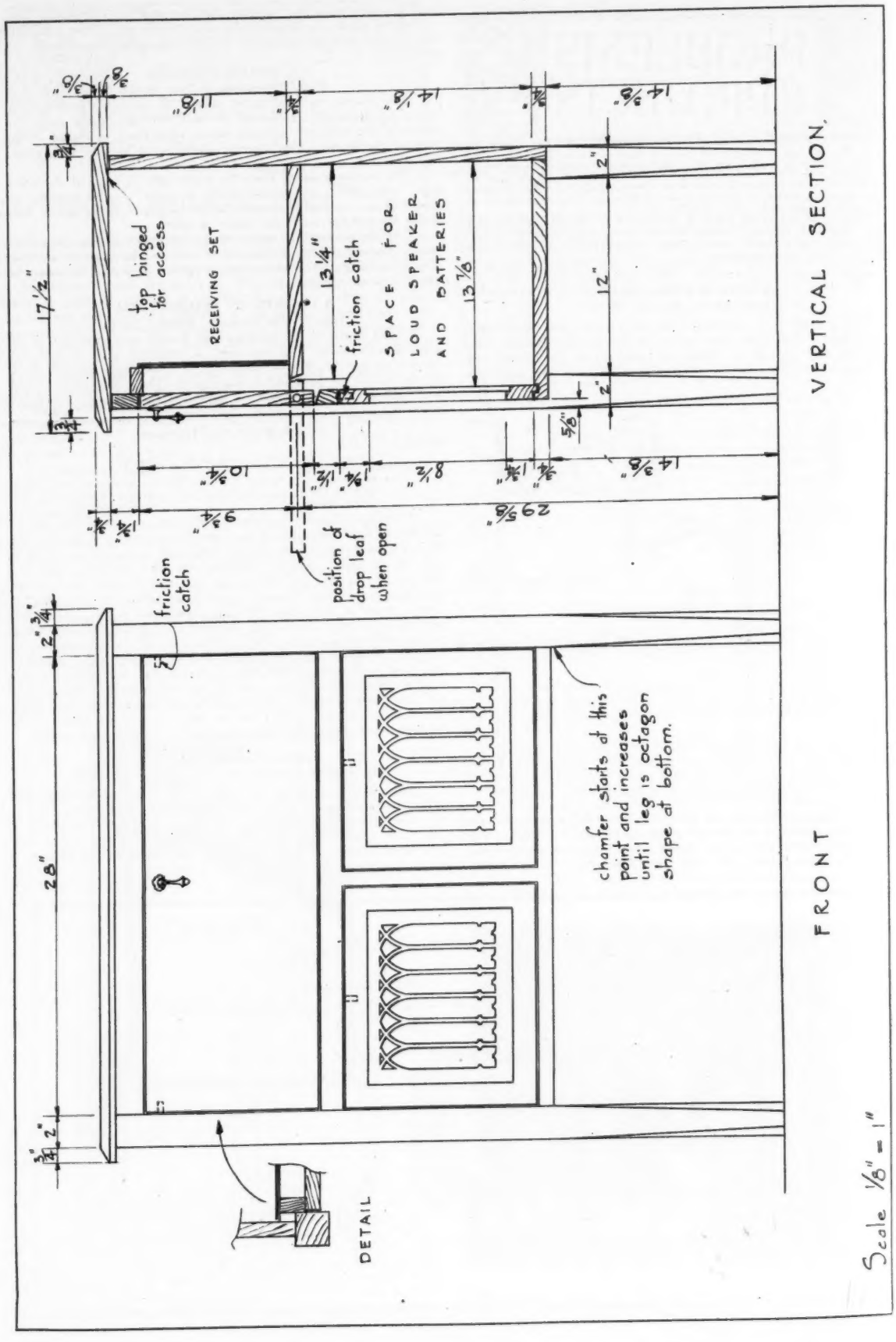
RADIO CABINET NO. 5

By Arthur Christensen and Gladstone Califf

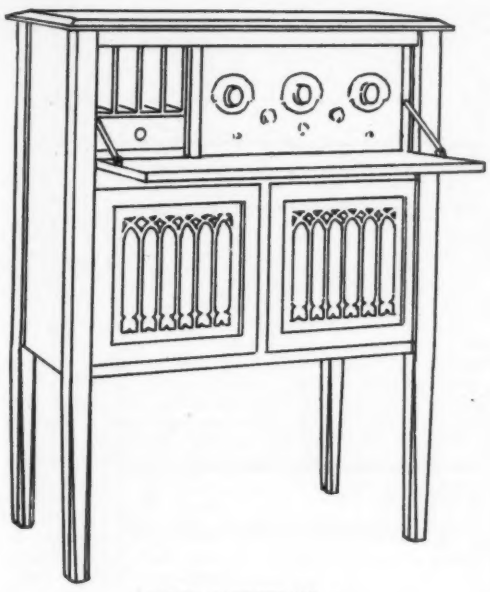
This design except for the grilles is all straight-line work. The joints can be either doweled or mortise-and-tenon, as preferred.

The utmost care should be used in the construction of the drop leaf. The pivot centers must be accurately located and bored true. The division strip under the drop leaf and the shelf are beveled to permit the passage of the lower edge of the drop leaf.





DETAILS OF RADIO CABINET NO. 3.



RADIO CABINET NO. 5.

The grilles are cut from 3-ply veneer set in frames which are removable for access to the batteries and loud speaker, and the top is hinged at the back for access to the receiving set. Holes should be bored in the shelf as required for wires.

4 pc.	2″ x 2 ″ x 41⅛″	Legs.
1 pc.	¾″ x 14⅜″ x 29¼″	Bottom.
1 pc.	¾″ x 13¼″ x 29¼″	Shelf.
1 pc.	⅛″ x 17½″ x 33½″	Top.
1 pc.	⅛″ x 28 ″ x 26¾″	Back.
2 pc.	⅛″ x 12 ″ x 26¾″	Ends.
1 pc.	¾″ x ¾″ x 13 ″	Front Division.
1 pc.	⅛″ x 1½″ x 30 ″	Front Division.
1 pc.	¾″ x 1¾″ x 30 ″	Front Division.
1 pc.	¾″ x 10¾″ x 28 ″	Drop Leaf.
2 pc.	⅛″ x 3 ″	Dowel Pins.
4 pc.	¾″ x 1¾″ x 12 ″	Grille Frames.
4 pc.	¾″ x 1¾″ x 13⅜″	Grille Frames.
2 pc.	9″ x 10⅜″	Veneer for Grilles.
2 pc.	¾″ x 1½″ x 10 ″	Dial Border.
1 pc.	¾″ x 1½″ x 28 ″	Dial Border.
1 pc.	10″ x 28 ″	Bakelite Panel.

2 Folding shelf brackets.
2 1½″ x 1½″ Cabinet hinges.
4 Friction catches.
1 Knob.
Screws, nails and silk or cretonne for grille cover.

NOTE: Finished sizes are given except length in which allowance has been made for tenons.

If desired a small drawer and pigeon holes for accessories, log book, etc., can be added as indicated in the perspective.

A PLUMB BOB

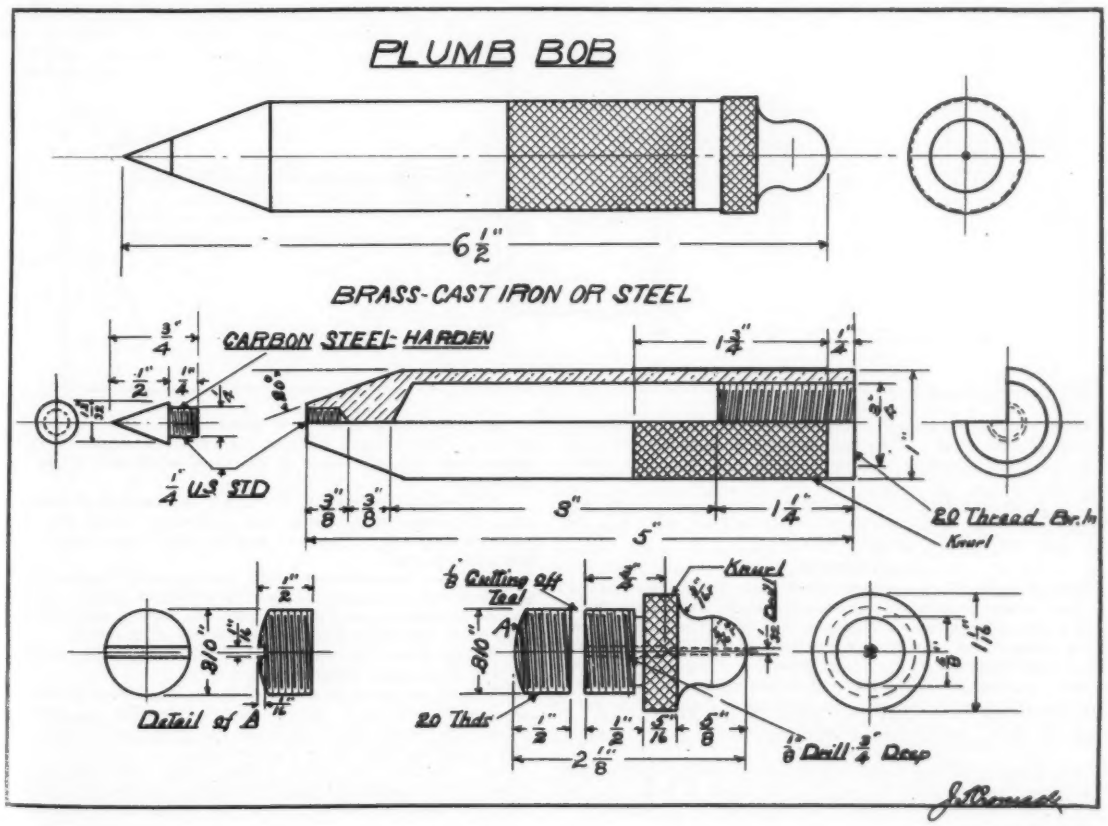
Joseph T. Cromack, Curtis Bay School, Baltimore, Md.

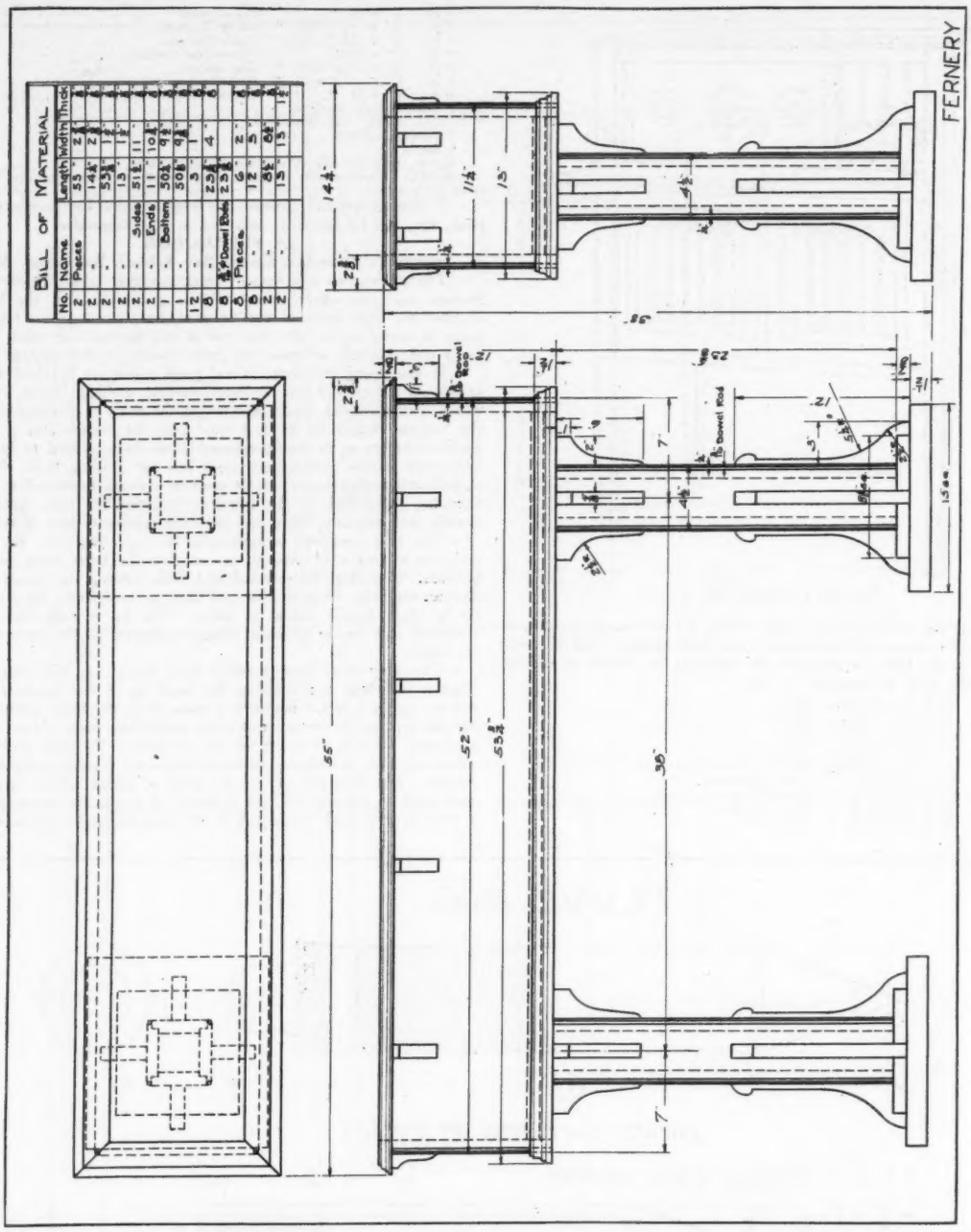
The plumb bob is a project which not only takes the eye of the student, but also offers almost all the operations that the lathe is adapted to. Any material can be used, but in using cast iron, care must be taken to see that the iron is not porous, but solid, and in using this material, or brass, the body should be steel tipped.

In machining the body, several good points are involved and the operations are quite a few, as rough cutting, drilling, boring the body to size inside, chasing inside, and facing the end. In finishing the body the outside should be finished true with the inside, and if several plumb bobs are to be made, a mandrel can be machined to fit in the lathe-head spindle and enough stock left for chasing, to fit the body thread; this mandrel can also be used as a gauge in threading bodies. Screwing the bodies on the mandrel, centering the end, turning the outside and knurling, filing and polishing completes part of the body.

The next operation is machining the tip, completing the thread end, but leaving stock enough to complete the taper when placed in position. Replacing the mandrel and body, setting the steady rest to support the body, while drilling and tapping, completing the taper with tip in place should follow in order. The tip is now ready to be hardened and finally polished, which completes all the operations on the body.

The plug must have material long enough to take care of the chasing, knurling, and forming the head, so all can be done in one setting, unless a socket mandrel is made to fit the head spindle; then, the top end can be formed and better machining done. After the plug is chased, the plug A is cut off and screwed in the body, to hold any substance, such as mercury, that may be placed there to make the body heavier. The threaded end of the plug is drilled with a larger drill than used on the top end, for it would be a difficult operation to run a small drill through the length of the plug, especially for boys.




FERNERY
BILL OF MATERIAL
No. Name Length Width Thick
2 Pieces 35" 2¼" 1"
2 " 14½" 2¼" 1"
2 " 33½" 1½" 1"
2 " 13" 1½" 1"
2 " Sides 51½" 11" 1"
2 " Ends 11" 10½" 1"
1 " Bottom 50½" 9½" ¾"
12 " 30½" 9½" ¾"
8 " 3" 1" ¾"
6 ¾" Dowel Rods 25¾" ¾"
5 Pieces 6" 2" ¾"
6 " 12" 5" 1"
2 " 25½" 6½" 1"
2 " 15" 15" 1"
DETAILS OF FERNERY DESIGNED BY EDWARD F. WORST.

After being assembled and a string attached the boys can certainly be proud of their project. They have found real interest in the trade and by adapting themselves they can make many things both useful and instructive.

This project is before them on a board, a piece for every step, and with the blue print, they have every chance to know what they are doing, and what the next operation is to be.

A FERNERY

Edward F. Worst, Supervisor of Shopwork, Chicago, Ill.

This fernery has been particularly successful as a junior high-school project. It may be made of any hard cabinet wood and given a finish of stain and varnish, or it may be made of a soft wood and finished with enamel or lacquer. The fernery is not only suitable for home use, but may also be made for the kindergarten.

A SCHEME FOR RATING PUPILS IN PRINTING

Frank P. Rich, Instructor in Printing, Tyler Street School, Boston, Mass.

It is necessary for instructors and teachers at certain stated periods of the school year to check the progress of pupils in order that the master of the school and the parents be informed of their progress.

In most schools there is a special system used for rating the students. These systems, however, are usually arranged for academic subjects only and leave much to be desired when used to rate pupils in shopwork.

The ordinary terms, A, B, C, D, E, meaning excellent, very good, fair, poor, etc., express little or nothing when used to rate pupils in shopwork. They lack sufficient detail and require a great deal of explaining.

Still more unsatisfactory is the snap-judgment method, with its guesswork and a tendency to cater to a favorite pupil, or the comparative method of giving the best pupil the highest mark, the poorest a low mark, and rating the others somewhere in between.

Ratings should be based on the fundamental factors entering in the line of endeavor being pursued.

In trade courses there are many factors which must be taken into consideration and which do not enter into regular classroom work. These trade factors should be listed and given due consideration by shop instructors when rating the shop pupil.

A satisfactory and easily worked system for rating pupils in shopwork is the score-card method of listing out the essential qualities or characteristics of the work involved as rating factors, and assigning

Chart for Determining Shop Rating of Pupils in Printing

Explanation—A pupil receiving 3 points in Speed is very slow; 23 points in Accuracy is fine. 14 points in Appreciation is handy, and so on with the other elements embraced in the chart below. The number of points received, when totaled, give the pupil his shop rating.

Speed Judged by student's general activity rather than by a time test.	Very Slow 3 points	Slow 4 points	Moderate 5 points	Fast 7 points	Rapid 8 points	Very Rapid 10 points
Accuracy Based on correctness and precision with which the work is done	Very Coarse 12 points	Coarse 15 points	Approximate 18 points	Close 20 points	Fine 23 points	Perfect 25 points
Workmanship Based on manner of handling type and all-round ability.	Rough 10 points	Crude 15 points	Fair 18 points	Good 20 points	Fine 23 points	Expert 25 points
Attitude Based on the student's mental reaction toward his work. His conduct.	Indifferent 10 points	Perfunctory 12 points	Passive 14 points	Interested 16 points	Eager 18 points	Enthusiastic 20 points
Aptitude Based on the natural inclination of the individual to master skill in this work.	Bungling 10 points	Clumsy 12 points	Handy 14 points	Capable 16 points	Dexterous 18 points	Clever 20 points

Key—A. Excellent 90-100. B. Very Good 80-89. C. Good 70-79. D. Fair 60-69. E. Poor 59 and under.

to each factor a value. These rating factors should be characteristics which really enter into the job for which the pupil is being rated.

After deciding the rating factors, a value should be assigned to each of them in order that the rating may be just. These values should be so distributed that the maximum points for all factors, when totaled, shall equal 100. The accompanying table, patterned after the U.T.A. School of Printing rating scheme, is the one in use in the writer's classes:

This type of rating scheme is very popular with the pupils as it is easily understood. Each factor has a definite value and the reason for the value is clear. The pupil can readily see how his points were earned and wherein he was lacking.

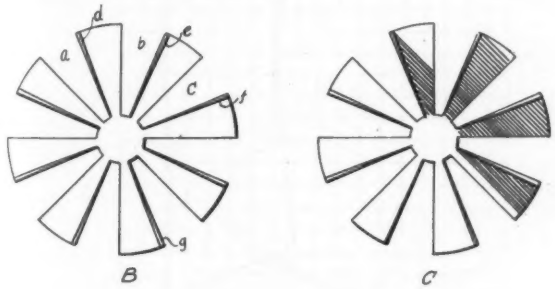
The simplicity of this rating scheme is such that it has been possible to allow pupils to rate themselves with honest results, in fact, they are more severe with themselves than the instructor.

It is now three years since I first used this rating scheme, and in this time I have never found it necessary to explain why a pupil received the mark given. It has eliminated all feeling of unfairness and has inspired the pupil to attain the highest rating possible with the confidence that he will be rated justly for work well rendered rather than for favoritism.

THE USE OF SHADE LINES

C. C. Hermann

Unless a drawing is perfectly clear, it is of very little value. In fact, errors in the machine shop, pattern shop, and in the field in connection with working from blue prints are generally traceable to lack of clearness in the drawing. Clearness in the drawing is as important as clearness of speech. Drawings constitute the language of the draftsman and the language must be known and clear to the one called upon to read and understand it.



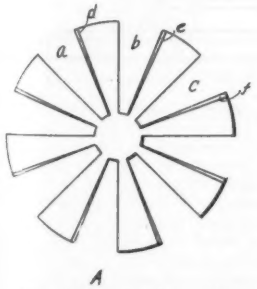


Fig. 1.

The draftsman is provided with various devices with which to convey clearness in his drawing. The most important and, in fact, the one most generally avoided is shade lines. In the schoolroom the draftsman is taught the use of shade lines, perhaps in a more or less haphazard manner, perhaps very thoroughly, but when he takes his first job in some drafting room he forgets all about the shade lines. Not infrequently the head draftsman instructs him to let the shade lines go. Regardless, the fact remains that very few draftsmen use shade lines. As a result the clearness of drawings is very much reduced. It is more like viewing a plane surface with numerous lines and dimensions thereon. The only way to determine a recessed portion from a raised portion is to refer to a projected elevation of the part drawn.

It is not intended that shade lines should replace projected views. The number of views of the object remain the same, that is, plan, end, and side elevations with as many other views and sections as may be necessary to convey the idea completely. However, by the use of shade lines the variation in plane elevation can be conveyed in the single view and the reading of the drawing facilitated to just that extent.

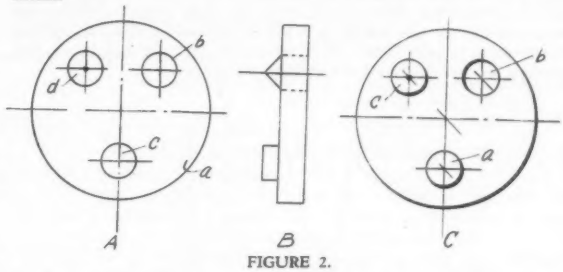


FIGURE 2.

To take a concrete example, consider the cooling-fan drawing of Figure 1. From this fan I have eliminated much of the detail, sufficient being shown to illustrate the present point in the use of shade lines. At A the fan blades are shown without shade lines. The impression gained from looking at this view is that the sections a, b, c, etc., are merely cut out of the flat circular plate and that the blades are all laying in the same plane, flat, with perhaps the edges of the blades turned up slightly so that the thickness of the metal is shown by the double lines along the edge of the blades as at d, e, f, etc. At B a similar view of the fan is shown and certain lines shaded as at d, e, f, etc. The shade line d indicates that the metal falls away from this edge. This is also indicated at e and at f. Notice that when we get around to g the shading is transferred to the parallel line. In view C we have gone just a step farther and shaded the blades indicating that the blades are warped surfaces and not flat as thought in connection with the view A.

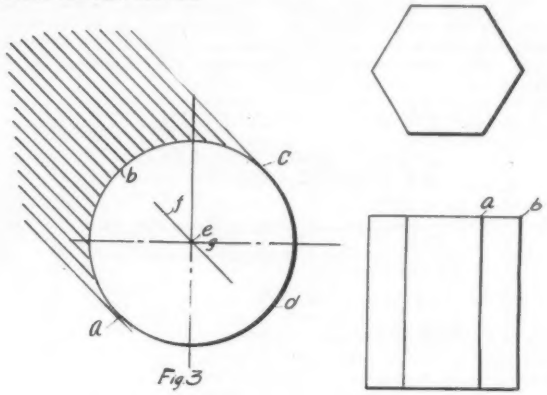


Fig. 4.

Another example which will illustrate the importance of shade lines is shown in Figure 2. At A is shown a flat plate a, with three circles thereon. From this view we do not know whether these circles represent holes in the plate or bosses thereon. It would be necessary to refer to the side elevation at B in order to know that at b we have a circular hole and at c a raised boss. The elevation also tells us that d must be a raised cone since the draftsman has shown the apex of the cone on A, however, from that view it could have been a depressed cone as well. At C we have shown a view similar to that at A but with the use of shading. We know at a glance that the point a is a raised boss, that at b, a circular hole or depression and that at c, a raised cone. It would be necessary, however, to refer to an elevation to determine the height of the boss and cone and whether the point b is rally a hole or a depression. It is quite apparent that the view C is the clearer method of the two. The reader can visualize the object and confirm his suspicions by a reference to the elevation. The theory underlying shading is that the light always comes from one invariable direction; that the light source is parallel with the plane of the paper;

that the light source is located at an angle of 45° with all horizontal and vertical lines of the drawing; and that the light position is at the upper left-hand corner of the drawing. This divides the drawing into light and dark sections. To determine the light from the dark section, all that is necessary is to determine whether or not a line drawn 45° to the left of a vertical will touch the surface. If so, that surface is light; if not, that surface is dark.

To illustrate, consider Figure 3, which shows a plan view of a flat disc. A series of parallel lines are drawn from the upper left corner with the 45° triangle. These lines touch the surface of the disc a, b, c, which is therefore light. The surface a, b, c, however, is not touched by the lines and is therefore dark.

There are exceptions. One which comes to mind is in Figure 4, which shows a hexagonal prism. The shading of the plan view is clear. In the side elevation the question may be asked regarding the shading of the line from a to b since this side is dark. Were this section of the top line shaded it would be the only portion of the line thus treated, therefore, the entire line is left light. It may be shaded, however, without rendering the drawing ambiguous.

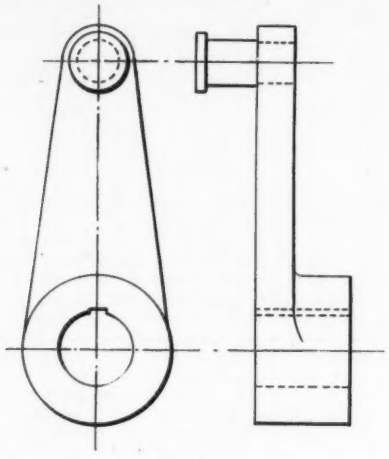
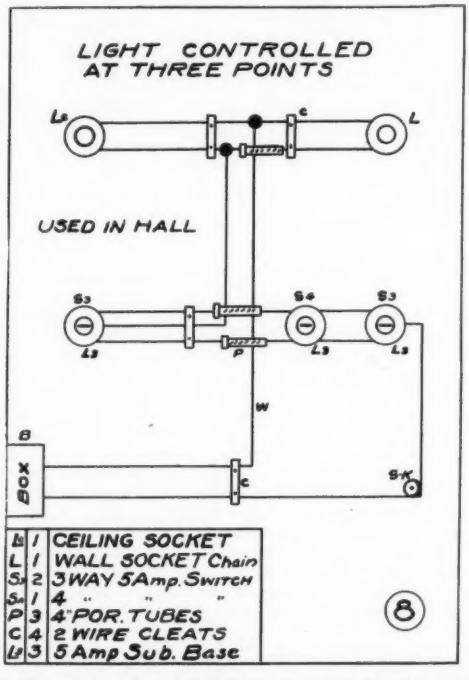
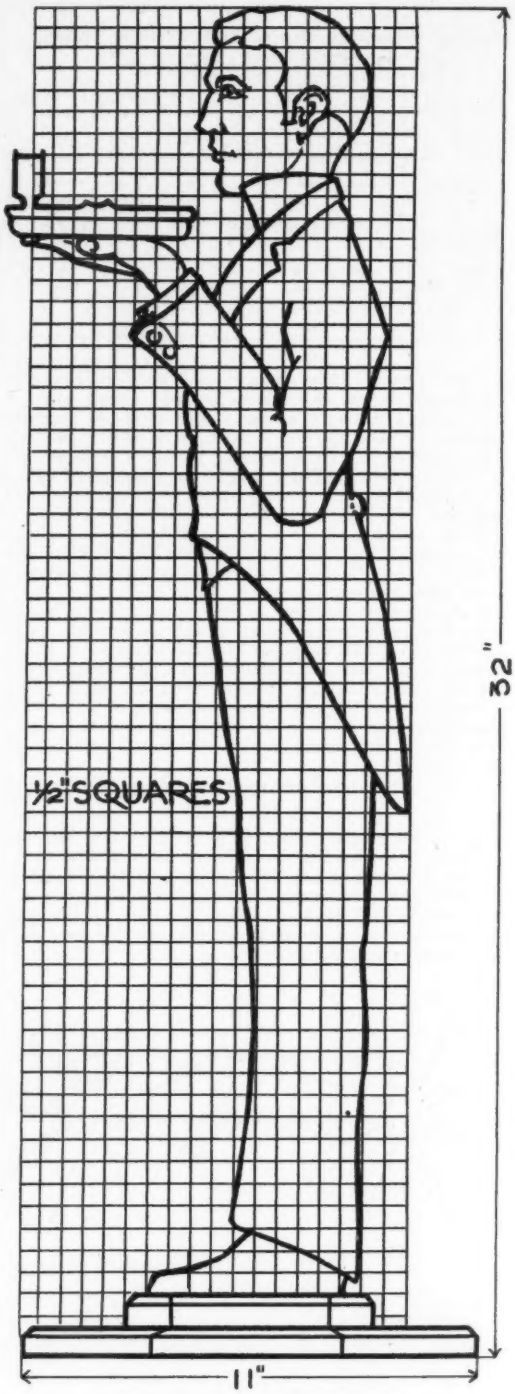


Fig 5

A practical example of shading is shown in Figure 5, which shows a wrought iron crank, finished size. The projections of the cylindrical bosses and circular holes are clearly indicated in the plan view of the object. This assists materially in obtaining a clear impression of the object.

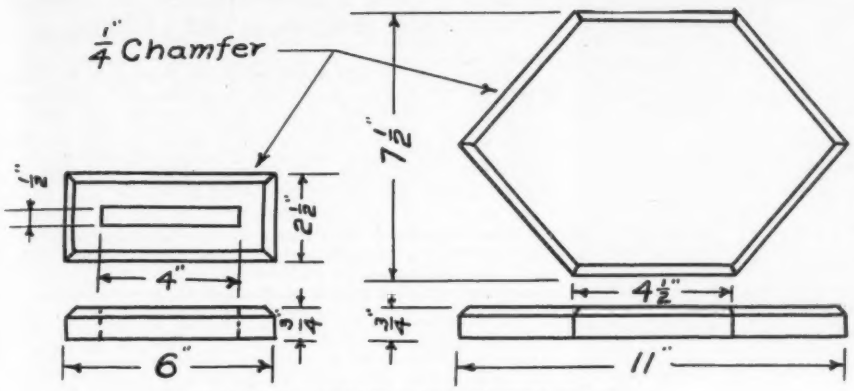

LIGHT CONTROLLED AT THREE POINTS
USED IN HALL
BOX
Lb 1 CEILING SOCKET
L 1 WALL SOCKET Chain
S3 2 3 WAY 5 Amp. SWITCH
S4 1 4 " " "
P 3 4" POR. TUBES
C 4 2 WIRE CLEATS
Lb 3 5 Amp Sub. Base
8

SUGGESTION FOR AN ELEMENTARY WIRING PROBLEM, PREPARED BY EMERSON W. MANZER, MADISON, WIS.



DETAILS OF SMOKING STAND.

The procedure to obtain correct shading is a matter not thoroughly understood. This accounts, perhaps, for its little use. The method, however, is comparatively simple. Referring again to Figure 3, the initial circle is made with the center e. A line f is drawn through the center at an angle of 45°. The compass is stepped along this line a distance from the original center equal to the thickness of the shading and with the same radius as originally used the arc is struck. Care must be exercised to see that the line is stopped coinciding with the original circle. The second center is indicated at g. This method gives a clear-cut shading line which eliminates the unsightly line end when using the same center and enlarging the radius as is often done. For the projection of a boss or raised portion the center is shifted downward on the 45° line. For a recess or circular hole the center is shifted upward on the same line.



DETAILS OF THE BASE OF THE SMOKING STAND.

SMOKING STAND

Clarence Berg, Council Bluffs, Ia.

This is a problem which an eighth-grade boy (as well as the older boys) can work out and enjoy; it involves the use of coping and scroll saws, chamfering, mortising, screwing, and sanding.

The material used is pine and the following pieces are needed:

1 pc.—½"x7"x32"
1 pc.—¾"x2½"x6"
1 pc.—¾"x7½"x11"
4—1¼ F. H. B.—No. 8 screws.

After the part B has been chamfered and mortised, glue it to the upright, then screw A to B. Sanding should be done before assembling.

In painting the man, the first thing to do is to outline the features and choose the paints to be applied. A suggestion for painting is: Hair, dark brown or black; face, flesh color (take cream or white and add a little red); collar, white, with a small black bow tie; the eyes will match the hair, and the ear a little darker than the face; the body black with a white vest and outline the coat in a deep purple. Leave a little space for the cuff in white.

A piece of felt is glued to the base. This, however, is optional. The tray is screwed to the arm before painting and is taken off and replaced after painting.

CARD TRAY

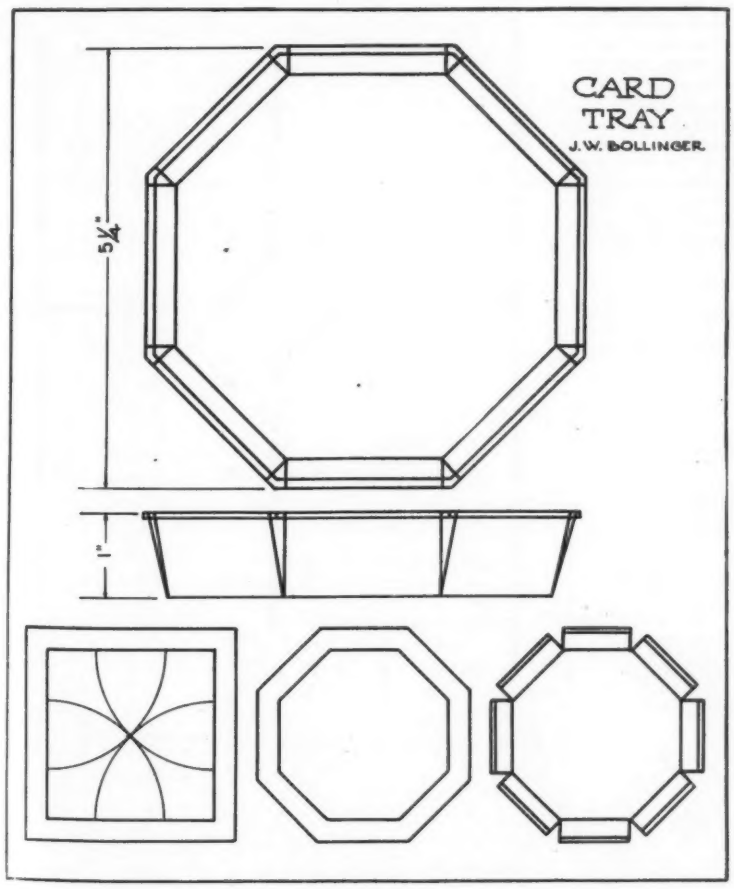
J. W. Bollinger, Roosevelt Junior High School, Tulsa, Okla.

This card tray, which might also be called a pin tray or a candy tray, is a simple problem, easy to make.

The problem is an excellent one for making use of some descriptive geometry work, namely, that of laying out a regular octagon. It offers excellent opportunity for accurate laying out, as any inequality will show up readily. There are no laps, and thus there is no soldering or riveting; the whole problem is held together by the No. 13 wire edge. The ends of the wire, which meet under the edge of one of the sides, might be sweat-soldered together, if necessary.

If possible, the whole problem should be enameled. Then there is a chance for painting some geometric design to harmonize with the problem, in the center.

A further variation which might be suggested, is that of attaching a long, bail-like handle across two of the sides. Such a handle should be about ¾" wide, with a wired edge, and about 18" total length.



DETAILS OF CARD TRAY.

A BETTER BLACKBOARD DRAWING

J. M. Wooddell, Parma, Ohio

Every shop instructor knows the limitations of chalk drawings placed on the blackboard of the manual-training shop. They may be accidentally erased, brushed against, or otherwise wholly or partially destroyed.

A drawing made with white show-card color, painted on the blackboard with a small brush, eliminates these disadvantages and possesses in addition, certain other good qualities. The contrast of lines and background is greater, thus making a more distinct and more finished drawing.

Such a drawing is easily made and will not rub off. After having served its purpose, the drawing can be washed off with a wet cloth.

AUTOCREEPER

E. C. Houston, Zanesville, Ohio

(See Supplement No. 54.)

The autocreeper sometimes called by automechanics the "roller board," is a practical problem that may be used in either junior or senior high school.

Some hardwood, such as oak, may be used to advantage in the construction of the project. The drawing supplement will show the creeper complete with both "tool containers." At the option of the maker, this may be made with one or both of the containers left off. In case both containers are eliminated a third piece 1½"x3"x21½" should be added and placed midway between the two end cross pieces.

The slats being ½" thick and 2" wide should have their top arises slightly rounded. These slats may be nailed to the cross pieces but a better way is to fasten them with screws.

A ⅜"x8½"x8½" board of any soft wood may be fastened to the three projecting slats of the headrest and upon this piece the upholstering is done. Moss covered with cotton batting may be used for filler and this tacked in place using burlap or muslin, and the whole

headrest is covered with rubber drill. To make a complete job, a binder should be used around the outside, fastened with upholsterers' tacks.

Either four or six casters may be used, screwing them securely to the cross pieces.

The project when finished should be filled, shellacked, and varnished in the usual way.

RADIO SYMBOLS

John F. Faber, Erie, Pa.

(See Supplement No. 56.)

The opportunity to motivate the students' interests through making, or repairing, radio sets is welcomed by many teachers and recognized by everyone.

The accompanying chart of standard radio symbols has been compiled from the best available sources and represents as near as possible the best practice of the present day. It will probably be many years before radio symbols are absolutely standardized because of the growth and constant change of the industry.

The chart will be of interest to drawing teachers who may be called upon to furnish a drawing for the construction of the radio set or to assist teachers who are making drawings independently. It will also be of interest to shop teachers and science teachers who are interested in radio because of their instructional work.

BINDING POSTS

H. D. Campbell, Oak Park, Ill.

(See Supplement No. 57.)

The thought behind the design of the binding posts, shown in the drawing, was for a product comparable in appearance to commercial posts, with the minimum of machine work and waste of stock.

Brass machine screws with the heads cut off and the shank soldered into the binding-post top obviates the necessity for any thread cutting except with taps. As designed, the operations are: simple turning, knurling, drilling, tapping, soldering, and assembling.

The ⅜-in. size posts are shown with a pin which projects into the panel or base. This prevents the post from turning loose when the top is unscrewed. The ½-in. size may be similarly equipped if desired, but the ⅜-in. size is too small to do so satisfactorily. The pins may be cut from brass escutcheon pins and sweated into place.

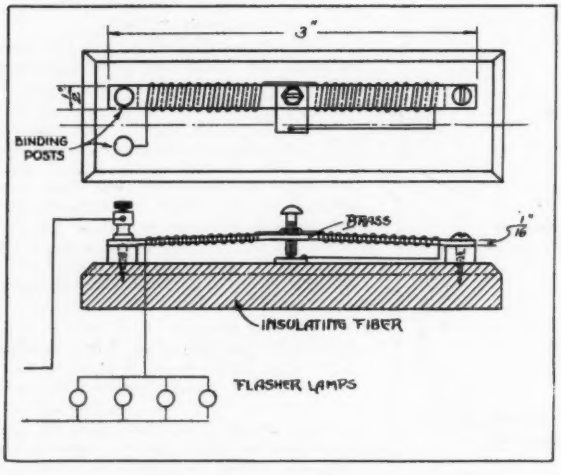
In order to sweat the threaded shank into the top, each should first have a very little flux applied. Next, the shank is tinned by dipping into molten solder. Last, it is turned into the tapped hole in the top, while that piece is held in a pair of hot tongs which keep the solder liquid.

Where it is desired to apply quantity-production methods, it may be best to drill and tap completely through the top and sweat longer screws into place, thus avoiding the use of bottoming taps.

The ⅛-in. posts can be made for five cents each, the ½-in. posts for seven cents, and the ⅜-in. posts for ten cents. The price quoted by electrical-supply houses for the ⅜-in. post is fifteen cents, for the ½-in. post twenty cents, and for the ⅝-in. post thirty cents. These prices are approximate, but illustrate the saving possible in making, rather than buying binding posts.

A CORRECTION

The illustration below shows the correct arrangement of the Sign Flasher which was published in the March issue of the INDUSTRIAL-ARTS MAGAZINE on page 108. In the original drawing the wiring was erroneously shown.



DETAILS OF SIGN FLASHER.

A GARDEN TROWEL

G. G. Greene, Lane Technical High School, Chicago

(See Supplement No. 55.)

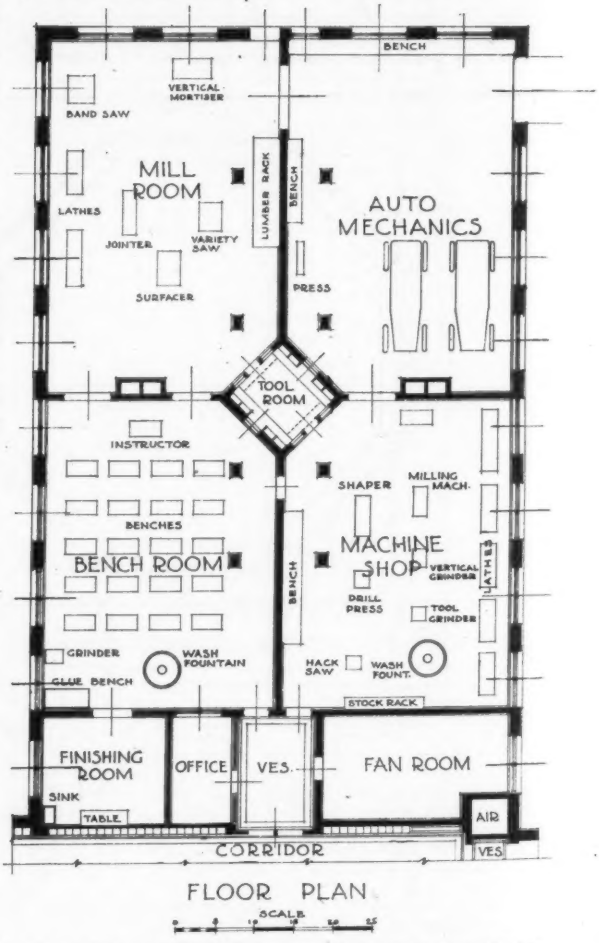
This is a cold-bending project which can be made in an ordinary grammar-school shop. The method of making and fastening the handle is very simple and results in a very desirable tool. After the trowel has been cut out of sheet steel, which should be about 18 gauge, it can be rounded to a cylindrical form by using half of an old bearing for a swage block. The trowel is suitable for planting small plants and bulbs and is a very useful home garden tool.

The vocational department of the public-school system of Syracuse, N. Y., has received high praise from Louis A. Wilson, state director of vocational education. Donald M. Kidd is the local director of vocational training at Syracuse.

The students of the vocational school at Utica, N. Y., built a complete seven-room, colonial-type house. They did all the actual construction work except the plumbing, plastering, and installation of the heating plant. They spent one half of their time on the job and the remainder in the classroom. The work was done under the guidance of instructors who are skilled mechanics and who have had professional training in trade teaching.

A bequest of $15,000 has been left by the estate of David H. Fanning to the schools of Worcester, Mass., to be used as prizes for the best work in domestic science.

Drawing Competition. The committee of award of the Eberhard Faber Co., Brooklyn, N. Y., recently announced the prize winners in the Van Dyke drawing competition. A total of eleven hundred drawings were examined by the committee which reported an exceedingly high average of work. First prize of $500 was awarded to Arthur Brusenbauch; second prize of $300 went to H. F. Roese, and third prize of $200 was given to H. V. Kline. Ten drawings received special honorable mention.



SHOP WING OF THE FOND DU LAC SENIOR HIGH SCHOOL, FOND DU LAC, WIS.
Perkins, Fellows & Hamilton, Architects, Chicago, Illinois.

PRINTING THE SMALL SCHOOL WEEKLY AND ANNUAL ON THE SCHOOL PRESS

Martin E. Malcolm, Rolling Bay, Washington

The problem of putting out publications in a small school where advertising is negligible and circulation runs under a hundred has been a serious one since high schools began putting out weeklies, monthlies, and annuals. For ten years, the boys and faculty of the Moran School, Rolling Bay, Wash., sought a solution without success. Typewritten and mimeographed papers were not read or respected because of their cheap appearance. Small professionally printed sheets came at an exorbitant cost; nobody wanted to subscribe for them or buy them. So much for weeklies, biweeklies, and monthlies. For the last five or six years, each member of the student body was required to take five copies of the annual "Varda," at one dollar a copy. But there was much grumbling at so high a price. Even when each boy paid five dollars, the editors were able to get out only a 24- to 28-page pamphlet. Nobody was satisfied, but an annual was greatly to be desired. Then last year the school printshop, which boasts only a few fonts of type and a small job press, decided to break away from the petty business it had been doing in blank forms, Christmas cards, etc., and offered a solution to the problem.

Their proposition was this: The student body was to turn over to the boys in the printshop the amount of money that was usually spent for the annual. The printshop was to get out a small weekly news sheet each Friday afternoon of the school year—a total of 34 issues—which would contain in brief form a record of all the important events of the preceding week. In addition, they were to get out 35 pages of such literary material as a board of editors should see fit to select, and at least fifteen pages of photographs. All was to be printed on 5½" x 7½" sheets, punched like loose-leaf filler, to fit art-paper covers that the shop would print, punch, and furnish with each subscription. Each student was to be allowed as many copies as he would call for regularly, along with a package of muslin, reinforcing rings, and brass pins to hold the books together.

The idea was to get out the "annual" on the installment plan, thereby furnishing a very complete history of the school year in the form of the combined weeklies; a fair specimen of the literary work of the school, and photographs of faculty, students, and several additional pages of "snaps." In an assembly, it was made perfectly clear to the students that they must keep all their pages as they came out, else they would not have complete annuals at the end of the year.

There was a green crew in the printshop. One boy and the faculty advisor were the only ones who had had any previous experience in printing, and they hadn't had very much. But they and the other four boys on the crew made up in nerve and enthusiasm what they lacked in technical knowledge and skill. They put the idea over with the students and then set to work. They did all they had promised, with a few sporting extras (on pink paper) and other special editions, for good measure. At the end of the school year, the students had annuals three times as large as ever before, and the school had received the benefit of a weekly as well. Not only that, but the printshop had earned the surplus—something over one hundred dollars—with which they plan to buy new type and other equipment they will need this year.

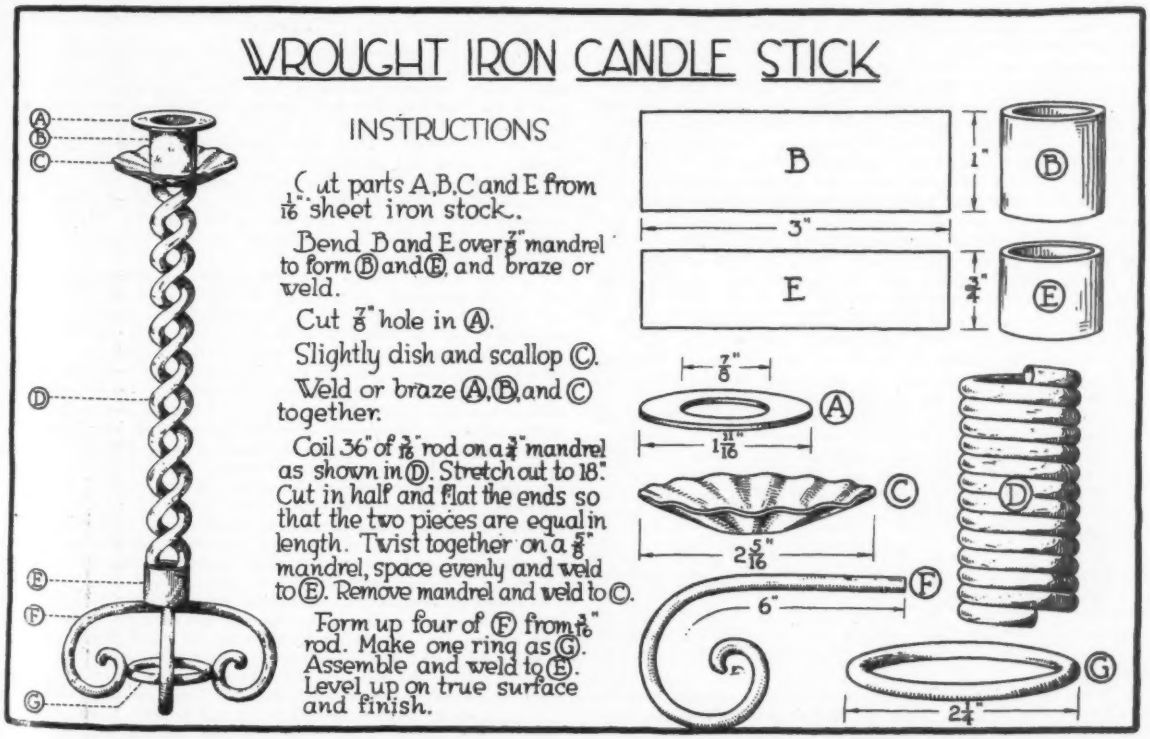
SECTION OF THE PRINTING DEPARTMENT AT THE MORAN SCHOOL, ROLLING BAY, WASH.

Many of the students bought leather ring covers in which to keep their "Vardas," while a few even had their collected sheets bound in black leather. Neither was at all necessary, though, for the paper covers were quite satisfactory.

The cost of the "Varda," aside from labor in the school shop was as follows:

Line etchings	$ 20.39
Halftones	143.45
Linotype	19.25
Printing halftones	36.00
Stock, complete	37.88
Ink	2.50
Brass paper fasteners	.88
Muslin reinforcing patches	9.50
Total	$269.85

The weekly was set and printed in the school shop. The literary section was printed by the students, but the material was linotyped by a Seattle typesetting company. The photographic section was printed by a professional shop, as it was impossible to print halftones on the little job press.


WROUGHT IRON CANDLE STICK
INSTRUCTIONS
Cut parts A,B,C and E from 1/16" sheet iron stock.
Bend B and E over 7/8" mandrel to form Ⓑ and Ⓔ and braze or weld.
Cut 7/8" hole in Ⓐ.
Slightly dish and scallop Ⓒ.
Weld or braze Ⓐ,Ⓑ and Ⓒ together.
Coil 36" of 3/16" rod on a 3/4" mandrel as shown in Ⓓ. Stretch out to 18". Cut in half and flat the ends so that the two pieces are equal in length. Twist together on a 5/8" mandrel, space evenly and weld to Ⓔ. Remove mandrel and weld to Ⓒ.
Form up four of Ⓕ from 3/16" rod. Make one ring as Ⓖ. Assemble and weld to Ⓔ. Level up on true surface and finish.
A
B
C
D
E
F
G
B
3"
1"
E
3/4"
7/8"
1 11/16"
2 5/16"
6"
2 1/4"

DETAILS OF WROUGHT IRON CANDLESTICK, DESIGNED BY O. C. GREENLEAF, SARNIA, ONTARIO, CANADA.

MARCH MEETING OF THE SCHOOL CRAFTS CLUB

The School Crafts Club of New York City held a regular meeting on Saturday evening, March 19, 1927, at the Geneva Restaurant on West 44th St. The program included two excellent talks and three round-table demonstrations.

"How Mahogany is Cut and Prepared for the Market" was the subject handled by Mr. H. Schmidt. Although Mr. Schmidt disclaims any right to be called an expert; nevertheless, as the colored brethren say, "He ain't nothing but." Mr. Schmidt, with engineering training, has spent much time with concerns handling mahogany and is an official of the Mahogany Association.

Mr. Schmidt pointed out the romantic position that mahogany occupies in history. A lot has been written concerning mahogany and its place as a leading cabinet wood, and yet little is known about it by the average person. The halo that has drifted around mahogany should be lifted in order that people might realize that it is a wood for the moderate home, and not only within the means of the wealthy.

Mahogany, as far as the civilized world is concerned, was discovered by Sir Walter Raleigh in 1597. At that time he used this native West-Indian-Island wood in repairing the planking of his ship. The natives used it for hollowing out into canoes, calling it "Kaoba." The decking was admired by Queen Elizabeth; whereupon Sir Walter Raleigh had some of it torn up in order that a cabinetmaker might make a table for the queen from this beautifully grained and colored wood. Mahogany jumped into favor overnight with buyers of fine furniture and cabinetmakers.

Mahogany does not grow in stands like our pine, but is the giant aristocrat of the tropical forest. Land which has an average of one and one-half trees to the acre is considered good. The height runs from 125 to 180 ft. Africa has the highest trees. The habitat of real mahogany is the West Indian islands, (Cuba, San Domingo, etc.) the Everglades of Florida, Central America, South America north of the Amazon, and West Africa. Every year 72,000,000 board feet of mahogany in log form are shipped to the United States.

As to quality, the San Domingo wood ranks first, being tight in texture, beautiful in color and grain, and heaviest in weight. The second best is the wood from Mexico. Some varieties of Mexican mahogany have acquired the name of baywood from the fact that the lumber grows in the swampy land surrounding a large bay. This lumber grows so rapidly because of the excess moisture that the texture of the wood is rather open. This baywood is a genuine mahogany of a variety which is light in weight and open grained. It is considered an excellent wood for patternmaking. African mahogany is soft, having a coarse texture, and ranges from brownish pink to pink in color.

Modern logging methods are not available for bringing out mahogany. After the territory is sighted from a height, trails are cut through the underbrush. A tree is cut here and there, sawed into 16-ft. lengths and, trimmed, and dragged by ox teams over the trails to the heads of streams. Sometimes it is possible to cut a road so that the logs can be carried by trucks from the trails to the streams. The mahogany tree is straight from the buttress for 65 to 80 ft. before it forks into two limbs. An average tree yields five or six 16-ft. logs. There is a tremendous buttress to the roots, making it necessary for the natives to build a crib of 6 to 12 ft. above the ground. From this crib or scaffold the tree is felled with axes. The logs run from 5 to 7 ft. in diameter, with occasionally one as large as 8 ft. through.

Mahogany logs are floated down the streams to seaports, where they are held behind large booms until they are loaded onto ships. A shipload runs from one half to three quarters of a million board feet. When the logs arrive in the United States, they are unloaded into mill ponds and are not piled on land. They are kept in water until cut up. Mechanical runways carry the logs into the sawmill, where they are first sawed lengthwise through the center. If a log has figured grain, it is set aside for veneer, but if it is plain in grain, it is sawed up into boards. After being sorted into No. 1, No. 2, No. 3, No. 3-common, and shorts, the boards are taken to the sun racks and so set up on end that the sun and air reaches all sides. It is said that the reaction between the ultra-violet rays of the sun and the sap in the wood brings about an oxidation, which causes the fiber of the mahogany to darken into the familiar reddish-brown color. Mahogany is not piled to weather as other woods are piled because of what is called "stick marks." These marks are light places protected from the sun. Weather seasoning is better than kiln drying, but due to the need of hurrying up the drying process a compromise between the two is usually necessary.

Two methods are used in the manufacture of veneers—sawing and knife cutting or slicing. In the saw method the log is quartered into what is known as the flitch. The flitches are resawed into veneer, sometimes as thin as $\frac{1}{32}$ in., although about $\frac{1}{24}$ in. allows more for scraping to remove saw marks. Sawed veneer is considered the strongest, since the grain of the wood is not disturbed as with the knife method.

When the slicing method is used, the flitch is steamed or boiled to soften the wood fibres. Then the flitch is clamped into the slicing machine, which has an 18-ft. steel knife. The flitch travels up and down, and the knife moves forward after each stroke. There is less loss in this process, since there is no saw kerf. Walnut is cut into veneer by the rotary method, in which the log revolves by the cutting knife. The knife moves forward the thickness of the veneer upon each revolution.

Mr. Schmidt suggests that a chemical stain of potassium bichromate be used on mahogany. The crystals are dissolved in water until a saturated solution results. This means that water has dissolved all of the chemical possible. When this is the case, crystals will stand in the bottom without dissolving. This concentrated solution is diluted with 20 parts of water. The mahogany darkens in color as the stain dries. More than one coat may be applied for a darker color. The usual finish of thinned shellac, filler, and varnish may be used. Mr. Schmidt closed with the suggestion: "Let Mahogany talk to you in its own language."

Mr. James H. Steenson spoke on "A Comparison Between Military Flying and Commercial Aviation." Mr. Steenson has been engaged in the designing of airplanes for fifteen years. He went over the details of typical airplanes, showing blue prints and discussing principles of physics and mechanics involved in the designing of airplanes. Some of the problems encountered are the proportion of air drag to lift, elevators, rudders, ailerons, power and speed of motor, adjustable seats, foot controls, landing gear, tail skid, etc. The air-cooled motor is coming into demand because the weight is less, and the dangers from loss and freezing of water are done away with. Airplanes for military use are equipped with synchronized guns, which are so controlled that the trigger will not operate when the propeller would be hit by a bullet. The bullets ride between the blades. Observers have the use of a Lewis gun mounted in such a way that it can be shot in nearly every direction. However, most of the shooting by the cadets is done with a gun camera, which shows what is aimed at. Radio apparatus is installed with a reel antenna, let out from the bottom of the fuselage.

When a newly designed airplane is finished, it is tried out, taken apart, shipped to a testing field, the fuselage and wings are reassembled, and if it proves to be right, production starts.

There were three round-table demonstrations. Mr. Russell F. Hemion took up "Veneering Methods in the School Shop." Mr. Charles Glasser gave a practical demonstration of the assembly of picture frames. Mr. Charles Thomas gave a demonstration of polychrome finishing.—*Lloyd F. Stair.*

THE AMERICAN VOCATIONAL ASSOCIATION CONVENTION

Edwin A. Lee

The editors of THE INDUSTRIAL-ARTS MAGAZINE, always enthusiastic supporters of the old National Society and of the Mid-West Association, and now of the American Vocational Association, have opened their columns for a monthly letter concerning the activities and problems of the association. The executive committee is grateful for this evidence of willing cooperation.

Most of the readers know that the next annual convention will be held in Los Angeles December 17, 19, and 20. There has been some concern expressed relative to these dates, particularly with reference to the possibility that their nearness to Christmas might make it impossible for delegates from the Atlantic seaboard to reach home in time for the holiday. Those who chose the dates had such a contingency in mind and set them so as to obviate this difficulty. Trains leave Los Angeles in such a way as to permit anyone who comes to the convention to attend every session and yet be assured of reaching his home not later than the afternoon of December 24. No one will need to be absent from his own fireside Christmas eve on account of the convention.

It wish it were possible to picture to you the intense enthusiasm with which westerners are preparing for this convention. The General Convention Committee of 26 individuals headed by the manager of personnel of the Southern California Edison Company has been actively functioning for over two months. Educational and political leaders of the state, headed by the governor of California, the president of the University of California, and the state superintendent of schools, have lent their names and interest to an honorary convention committee of 21. Before this is read, a banquet will have been held in Los Angeles for the purpose of informing the public generally as to the scope and meaning of the convention. Secretary Z. M. Smith, the president of the American Vocational Association, and Nicholas Ricciardi, president of the state directors' association, will be the principal speakers. Seated at the banquet table will be committeemen, representatives of the members of the honorary committee, and other interested men and women. At last reports the number seeking reservation was four hundred.

I have no hesitation in forecasting an extremely significant convention. The program is already assuming definite form. Reservations from visitors are commencing to arrive at the official hotel, the Los Angeles Biltmore. The exhibitors are manifesting an early interest in their part of the meeting. The entertainment features, including visits to the splendid new Frank Wiggins Trade School, which will keep open house Friday, December 16, will fittingly round out the more serious aspects of the program. The thoughts and plans of

every person interested in the development of vocational education ought to be pointed toward attendance upon the Los Angeles convention of the American Vocational Association.

CONVENTION DATES ANNOUNCED

The American Vocational Association will hold its next meeting December 17, 19, and 20, at Los Angeles, Calif. The selection of these dates will make it possible for the visitors to be at the different sessions and to devote the close of the week to sight-seeing, making it possible for middle-western and eastern visitors to depart for their homes on Tuesday afternoon just preceding the Christmas season.

The various committees in charge of the arrangements for the convention are at work and it is expected that the meeting will exceed in importance and interest all previous ones. At least 1,500 persons will be in attendance at the meeting.

VOCATIONAL-EDUCATION SOCIETY OF BOSTON MEETS

The regular monthly luncheon meeting of the Vocational-Education Society of Boston was held Saturday, March 12, at Hotel Westminster, Copley Square, with 45 in attendance. The program, in contrast to the usual practice of having an outside speaker, consisted of three talks by members of the society, on topics to which they were able to make interesting and valuable contributions.

Mr. William Moore, sheet-metal instructor in the Sherwin school, Boston, spoke on "Correlation of Science and Shopwork." He referred in his remarks to a recent address by Angelo Patri on "Creative Thinking," and advanced the proposition that shopwork inculcates such thinking more effectively than any other school subject. "Even science, when taught as a theoretical subject in laboratories filled with artificial equipment far removed from the experiences of ordinary life, does little to encourage constructive thinking on the part of the pupil," said Mr. Moore. "As a consequence, it is quite as readily forgotten as the subject matter of any other school course; despite the fact that its primary justification and purpose should be the imparting of an ability to interpret the facts of everyday experience."

One of the illustrations of Mr. Moore's talk was a graphic contrast between the traditional method and the shop method of science teaching, since it dealt with one of the elementary experiments of the physical laboratory. In his shop Mr. Moore took strips of brass, copper, and iron, respectively, and gave them to three different boys to hold by the end. The other ends of the strips were then brought together around a lighted gas burner. Each boy was instructed to retain his hold on his particular bit of metal as long as he could do so without actually burning his hand. The other members of the group crowded around as interested spectators. No statement was previously made of the heat-conducting properties of the various metals; indeed, the term "conductivity" was not used. Every boy in the class, however, had an unforgettable lesson on the rapidity with which heat travels through the various metals. The experiment was vital with reality, instead of being smothered under the stage-trappings of laboratory magic.

In making solder in the shop, Mr. Moore sedulously avoids telling his pupils anything about the melting points of tin and lead. Identical quantities of each metal, however, are placed in separate melting pots over the flame, while three members of the class who own watches act as timekeepers, and others serve as referees to announce when each metal reaches the liquid stage.

The very heart of Mr. Moore's method is to tell the pupil as little as possible, and to let him use his own reasoning power as far as it will carry him, developing the power in use. Science is not an abstract thing, and should not be made so. It little profits a boy to absorb textbook pages, or to perform dutifully an outlined experiment under precisely predetermined conditions, if he does not learn to think a matter through to its everyday applications. Mr. Moore told of a boy who had some home soldering to do, and who had all the necessary materials except flux. The boy announced proudly that he had succeeded in making a hair oil serve the purpose of the missing material. That boy had a better understanding of soldering fluxes than one who might be able to give the chemical formula for "cut acid"—which, after all, can hardly be classed as useful information.

Science is all around us, insisted Mr. Moore. It is present especially in the shops. The average tradesman makes far more use of it than does the college graduate. Every trade furnishes innumerable applications of science which a doctor of philosophy might explain, but would be at an utter loss to use. The shop teacher need defer to no one. He should rid himself of any "inferiority complex" which he may possess, and realize that his practical mastery of science is more important than pure theory. The shopman should not and need not use textbooks; he should himself be a textbook.

Mr. Moore concluded by telling of a trip to his old home in Scotland. He sat with his mother in the cottage with its massive masonry walls and its ancient timbers which had sheltered many generations. With the aid of a little box on the table, the two of them sat and listened to "Big Ben" chiming the hour in London, seven hundred miles away, and heard Prime Minister Baldwin delivering an address. At a sound outdoors, Mr. Moore rose to investigate, and his mother told him that it was the mail plane, carrying the evening mail to Ireland and running exactly true to schedule. "I wouldn't be surprised," said the old lady, "if in a few years we would be able to talk to each other across the Atlantic." And now, only a few months later, that, too, has become an actuality!

Mr. Leslie S. Burnell, in point of service one of the oldest printing instructors in the state, and for several years with the English high school, Lynn, next spoke on "The Place of Printing in the High School."

"Education," he quoted, "reaches its maximum when all the powers of the pupil are most ably employed." The industrial subjects for this reason are likely to have a more permanent value than the cultural subjects. "How many men ten years out of high school," asked the speaker, "can solve a problem in quadratics? How many, on the other hand, having had manual training in school, would be at a loss if called upon to construct a table or a desk?"

Printing shares with other trade subjects the cultivation of permanently-retained abilities. It has, besides, its own specific values in the curriculum. It correlates in a high degree with at least four other subjects: language, art, science, and mathematics. Prominent among its claims is its high social value. The printing of a school paper is an enterprise which is fruitful in school and civic spirit. The "community book" was mentioned as a project stimulative of civic pride. The very fact that most pieces of printing are the product not of one individual, but of several working cooperatively, is a valuable lesson.

Mr. Burnell listed five leading "social demands," and showed how printing contributes to them, as follows:

World Security. Mutual understanding, appreciation, and regard between nations is aided by printing, more, perhaps, than by any other one force.

Productivity. The world's business depends largely upon advertising through the medium of the printed word.

Economy. Printing magnifies talent. It multiplies in books and magazines knowledge which would otherwise have to be discovered anew.

Justice. The spreading of truth through the press is the most potent force in bringing about the reign of justice.

Beauty. The service of printing in this respect has given rise to its common designation as "the art preservative of other arts."

The study of printing can contribute to every legitimate aim of education, said Mr. Burnell, discussing in detail its educative values. From the vocational standpoint, too, it is well worth while. There are a hundred distinct occupations in the graphic-arts industries, employing in 21,000 establishments, a quarter of a million workers. Mr. Burnell read a list of a dozen famous men—culled, he said, from a much longer list which he had prepared—who had been printers, and who throughout life took pride in the fact.

Mr. James T. Gearon, director of the Everett continuation school, spoke on the subject, "Professional Improvement for Shop Teachers: Why, and How." President Baker, in making the introduction, announced that Mr. Gearon last June received a degree from Boston University, after several years of part-time study.

Mr. Gearon gave four reasons for professional-improvement efforts on the part of shop teachers. First, the men from trades who are entering the teaching ranks in numbers each year, are likely to have a less adequate general education than teachers of nonshop subjects. Of professional training, they are likely to have only the small minimum which is a prerequisite to employment. Even in their own respective trade fields, these new teachers may be lacking in the technical phases of the trade; or they may be overspecialized, and thus deficient in all-around knowledge and skill even on the manipulative side.

Second, under practical conditions, it is not possible for shopmen to get, nor for school authorities to require, as much training as is really needed, in advance of appointment. The new shop teacher is really an "apprentice" at the teaching profession, with much to learn before he becomes even ordinarily competent.

Third, the teaching profession itself is constantly advancing. Any man in that profession can keep up with the parade only by constant study.

Finally, no true success or satisfaction can come to a teacher who does not keep alive in himself the attitude of a learner.

Teachers may be classified in respect to professional-improvement needs under several distinct headings, said Mr. Gearon. The ambitious type needs no explaining. The conservative type is sincere and willing, but is wedded to old ways. The teacher lacking in preparation, or even in natural aptitude, is not hopeless, unless he remains unconscious of his own shortcomings. There is also the new teacher in the early stages of his professional life.

Every teacher should deliberately study himself to see if he possesses special weaknesses or deficiencies which ought to be remedied. After that, he may turn himself to the tasks of adding to his special knowledge and skill; increasing his professional background; improving himself along general cultural lines; and finally, making individual contributions to the profession. Agencies to be used include reading, summer schools, college and extension courses, travel, participation in community affairs, visiting other schools, attending teachers' institutes and meetings, serving on committees for preparing courses, and so forth. Mr. Gearon gave specific information about educational opportunities which are available locally. He stressed the truth that

while professional improvement of teachers is a requirement in most systems, it should be undertaken in a spirit which looks upon it as a privilege and an opportunity. "The teacher who is content with what he himself knows, cannot make pupils discontented with ignorance."

Some time was given to discussions of the topics presented. President Baker announced tentative plans for a visit by the society during the spring vacation to the new Ford plant in Somerville.

PROGRAM FOR WESTERN ARTS MEETING AT MILWAUKEE

The 33rd annual meeting of the Western Arts Association will be held May 4, 5, 6 and 7, at Milwaukee, Wis. The general and sectional meetings will be held in the Milwaukee Auditorium. The following tentative program has been prepared.

Wednesday, May 4

Addresses of Welcome—Mayor Daniel W. Hoan of Milwaukee, and Supt. Milton C. Potter.

Response—President Elmer W. Christy, Cincinnati, Ohio.

Address—Mr. Richard F. Bach, Metropolitan Museum of Art, New York, N. Y.

Thursday, May 5

The Challenging Aspects of Practical-Arts Education—Prof. A. H. Edgerton, University of Wisconsin, Madison.

Art in Everyday Life—Miss Harriet Goldstein, University of Minnesota.

Address—Miss Mamie Mutz, Stout Institute, Menomonie, Wis.

Creators and Consumers of Art—Prof. A. H. Edgerton, University of Wisconsin, Madison.

Newer Aspects of Art Education—Miss Mary C. Scovel, The Art Institute, Chicago, Ill.

Address—Prof. R. L. Cooley, Vocational School, Milwaukee, Wis.

Address—Mr. Ammon Swope, professor of trade and industrial education, Purdue University, Lafayette, Ind.

The Part-Time Movement in America—Mr. George P. Hambrecht, director of the state board of vocational education, Madison, Wis.

Printing Design as a School Subject—Mr. Ralph W. Polk, principal of the Robidoux Polytechnic School, St. Joseph, Mo.

The Relation Between Fine Printing and Paper—Mr. Ray B. Keller, Hammermill Paper Company, Erie, Pa.

Better School Publications—Mr. Harry Hillman, The Inland Printer, Chicago, Ill.

Address—Mr. A. G. Pelikan, director of art, Milwaukee, Wis.

Friday, May 6

Modern Ideas in Art and Art Education—Mr. Thomas Munro, Barnes Foundation.

Modern Ways of Old Masters—Mr. Rossiter Howard, Cleveland Museum of Art.

Color—Mr. Walter Sargent, director of art, University of Chicago.

The Practical Value of Art—Mr. A. G. Pelikan, director of art, Milwaukee, Wis.

Address—Mr. Rossiter Howard, curator of educational department, Cleveland Museum of Art.

Terminology in Art Instruction—Wm. G. Whitford, University of Chicago.

Creative Design for High Schools—Miss Alfrida Storm, Northwestern University, Evanston, Ill.

Abilities and Knowledge Tests in Household Mechanics—Mr. Earl L. Bedell, director of vocational education, Detroit, Mich.

The Unit General Shop—Mr. F. W. Grosstuck, coordinator of general shops, Joliet Township High School, Joliet, Ill.

The Consolidated General Shop—Mr. J. E. Martin, Lakewood, Ohio..

Manual Arts in the Senior High School—Mr. O. H. Day, director of industrial education, Kansas City, Mo.

Saturday, May 7

The Deeper Significance of Art—Mr. F. D. Slutz, director of the Moraine Park School, Dayton, Ohio.

Beautiful Bark and Boats (illustrated lecture)—Mr. Otto Ege, Cleveland School of Art, Cleveland, Ohio.

Business meeting and election of officers.

TULSA MANUAL-ARTS CLUB

The March meeting of the club was held in Bartlesville, Okla., some 60 miles north of Tulsa, at the invitation of Mr. Herbert Detjen, in charge of the manual-arts department at the new Junior-Senior High School at Bartlesville. Considering the fact that the weather man staged a severe rain and hailstorm, it must be said that the meeting was well attended. Some 42 persons registered at the meetings, not counting the wives and children of six of the party; two states and eight cities had representatives present. All but two of the Tulsa men were there; the Bartlesville contingent included the manual-arts staff, of course; also Mr. E. C. Foster, principal; Mr. L. A. Rowland of the board of education, and Mr. Charles A. Haskell, superintendent of schools. From Ponca City came Lyle J. Dewey and W. A. Scott; from Hominy, Maurice Ghorney and Chas. L. Holley; from Okmulgee, D. L. Marsee and W. H. Coppedge; from Coffeyville, Kansas, Harvey E. Ruff, S. L. Highbaugh, and Harry McGinnis; from Caney, Kansas, C. L. Hill; and from Pittsburg, Kansas, R. W. Erskine, professor of manual arts at the state teachers' college there.

For the afternoon program, Mr. Detjen conducted the group through the shops, discussing the arrangements, giving and receiving suggestions and ideas. He then outlined his program, after which every one present had some comment to make or question to raise. Each man felt that it had been an advantage to him to have seen how another group of teachers "does it," and to know that they themselves were not the only ones with problems to solve. As Mr. Dewey put it, if one man gives another a dollar, and receives a dollar in return, neither profits thereby, but if one man gives the other a good idea and receives a good idea in return, then both profit.

Thereafter the body adjourned to the Hotel Marie, where supper was served. Professor R. W. Erskine read a paper written by Mr. Ray Williams of Kansas State Teachers' College on "The Manual Arts in the Junior High School." Mr. Harry McGinnis, supervisor of manual-arts work at Coffeyville, Kansas, talked on "Some Problems of the General Metal Shop." Mr. McGinnis stressed the necessity for keeping in mind the aims of the shopwork, whether it be the teaching of skills, or the "exposure" to experiences, and that the aim would of course determine the mode of procedure. The problems of the job sheet, class organization, and discipline were raised and discussed.

At the conclusion of the meeting, it was hoped that the invitation to Bartlesville would come again next year, and each man went home cheerful even though it still continued to rain in torrents.—*J. W. Bollinger.*

NOW, ARE THERE ANY QUESTIONS?

Finishing Brier Pipes

717. Q.: Would you please have Mr. Waring give me the formula used in making the stain used by pipe manufacturers on brierwood?—J. F. K.

A.: In general there is no formula for stain used in French brier pipe manufacture. The general method is to rough out the blank, trim it or carve it as the case may be, sand for finish, rough bore for the stem and bowl, after which the carefully kiln-dried pieces are dropped into rather hot linseed oil and ceresin, a very hard petroleum wax, not paraffine. When cool, the blanks are put into slow turning churns, mixed with soft leather scraps and tumbled until a high polish results. The choicer specimens are hand buffed or polished on a rag wheel as for silver plating work. After the tumbling or buffing the pipes are reamed for finish in the stem and bowl, tapped for stem thread and stemmed.—*Ralph G. Waring.*

Finishing Port Orford Cedar

718. Q.: I would like to know how to get an oil (stain) finish resembling red cedar, but using Port Orford cedar. I have tentatively tried several combinations but they are none of them satisfactory. —A. B. B.

A.: Your question in regard to the treatment of Port Orford cedar to resemble southern red cedar is very difficult and probably impractical.

This soft, even-textured, creamy-white, light wood bears not the slightest resemblance to *Juniperous virginiana*, the hard, heavy, knotty, cream sapwood and red-purple heartwood of the southern cedar. In view of the fact that so many cedar chests are now being finished in walnut trim, veneer, or walnut finish on poplar, it would seem most practical for you to follow this line of action by producing either a walnut or mahogany finish on the outside only of your cases. For instance, a fine brown oil stain may be made from asphaltum varnish reduced with either turpentine or gasoline and applied with either a brush or by dipping. When the case is partly dried, grain effects may be produced with an almost dry brush or wadded cloth. This coat should be allowed to dry over night and may then be shellacked and varnished as desired.

The General Dyestuff Corporation, 122 Hudson Street, New York City, is able to supply you with a full line of walnut and mahogany stains in oil soluble colors.—*Ralph G. Waring.*

Archery

721. Q.: I would like to get some information about archery—the making of bows and arrows, and the construction of bows.—A. G. W.

A.: You can find full information on the making of bows and arrows in the "Popular Science Monthly" for July, 1926, page 69. Dan Beard writes in this article just the type of information needed for making bows and arrows in the school shop.

Among the references which will be found helpful are the following: Pope's *Adventurous Bowman*, $4.50, G. P. Putnam, New York City; Elmer's *Archery*, $5, Penn Publishing Co., Philadelphia, Pa.; Pope's *Study of Bows and Arrows*, $1.75, University of California, Berkeley; Pope's *Yahi Archery*, $0.75, University of California; *Revival of Archery*, Popular Mechanics, July, 1925; *Archery—The Latest Summer Sport*, Popular Science Monthly, July, 1926.

Commercially, bows are made of Oregon Yew, but second-growth hickory may also be used with considerable satisfaction. However, the wood must be second growth and must be carefully split with the grain. For arrows, boxwood, birch, or maple may be used. Oregon Yew may be purchased from the Carman Mfg. Co., Portland, Oreg., or from the California By-Products Co., 2067 San Bruno Ave., San Francisco, Calif. The latter firm cuts yew especially for arrow purposes.

A marking gauge of merit

THE Stanley Marking Gauge No. 265 is especially adapted to school use. It is made of the same high quality of boxwood that is used in the manufacture of Stanley Rules. It has a brass screw, brass shoe and face plate, and an adjustable point. A round-head screw at the end of the beam keeps the head from sliding off. This adds materially to the life and accuracy of the gauge, and eliminates the loss of the brass shoe.

A distinct feature of the No. 265 gauge is that it is not graduated. This is an aid to good craftsmanship, as it makes necessary the setting of the gauge with a rule. Thus inaccuracies due to improper setting and filing of the pin are avoided.

Stanley Gauge No. 265 is furnished with a square head only. No. 264½ is made of beechwood and has an oval head.

THE STANLEY RULE AND LEVEL PLANT
Educational Department
NEW BRITAIN, CONNECTICUT

THE Stanley Catalog No. 34-G should be in the hands of every Manual Arts Instructor or Vocational Supervisor. It lists and shows pictures of over 1500 items, as well as detailed drawings of their construction and adjustment.

In addition, the appendix gives a number of tables covering subjects pertinent to woodworking.

You should have a copy of Catalog No. 34-G by all means. Send for yours today.

STANLEY TOOLS

STANLEY EQUIPMENT IS STANDARD EQUIPMENT

Good Schools deserve "YANKEE" TOOLS

"Yankee" Screw-drivers have Double Strength

No job can make the blade of a "Yankee" Plain Screw-driver turn or loosen in the handle.

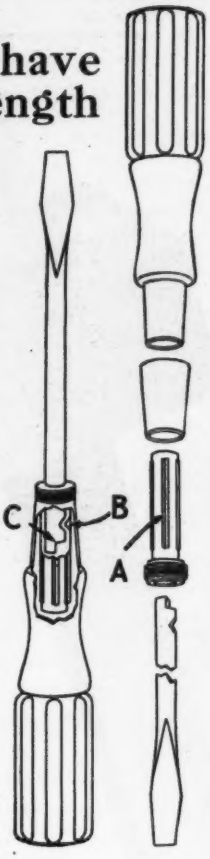
Here are the reasons:

Blade and handle are locked together by a special "Yankee" device (see illustration). The blade can't turn in handle because—

(A) Bolster has four teeth extending its entire length, which when forced by heavy press into wood of handle makes it impossible to turn blade or bolster in handle.

(B) Metal of bolster is punched down into nick on shank of blade to prevent pulling out.

(C) End of shank is offset and fits into offset of bolster to prevent turning.



This ingenious "Yankee" construction (found in no other screw-driver) makes blade and handle practically a one-piece tool.

Every individual blade is tested twice before leaving factory—another reason why a "Yankee" Driver lasts.

No. 90—Standard Style, 15 sizes, 1½ to 30 in. blades.

No. 95—Cabinet style, 11 sizes, 2½ to 15½ in. blades.

Some other "Yankee" Tools

Ratchet Screw-drivers
Spiral Screw-drivers
Ratchet Bit Braces
Ratchet Breast and Hand Drills
Automatic Push Drills
Automatic Feed Bench Drills
Ratchet Tap Wrenches
Vises, Removable Base

Write for FREE "Yankee" Tool Book

This interesting little book is for all lovers of fine tools. It tells just what you want to know about all the famous "Yankee" Tools for making work easier and quicker.

Dealers Everywhere Sell "Yankee" Tools

"Yankee" on the tool you buy means the utmost in quality, efficiency and durability.

NORTH BROS. MFG. CO., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

McKINLEY HIGH SCHOOL HAS PAPER EXHIBIT

Chester A. Lyle, McKinley High School, Canton, Ohio

What is believed to be the first paper exhibit ever conducted by a high-school printing department as part of its regular course has been concluded at the McKinley High School, Canton, Ohio. Intended originally as an exhibit for the printing classes, the idea of a paper exhibit which would be for the benefit of, not only the pupils of the high school, but the general public, took shape and by the interest and enthusiasm that the mills and the paper dealers took in the project, it was finally decided to try and make it a real paper exhibit. The exhibit opened on Monday, January 31, and closed Friday, February 25. The doors were open to the public from 3:15 to 5:15 and from 7:15 to 9:15 p. m., five nights a week.

The printing classes worked three months in perfecting plans and arranging and mounting displays. Many departments gave a willing hand toward making the exhibit a success. Thus, the sheet-metal department made the hangers for the displays that were hung on the walls; the department of visual education ran the films in connection with the exhibit; the mill department made the special bulletin boards authorized by the school board. These boards were made of beaver board, painted black with silver-painted frames. Two-foot stands for the bulletin board made it possible to use both sides of the boards for display. The English department wrote the copy for the pamphlets and other advertising; the evening printing classes helped to set and run part of the advertising material; the art department arranged and mounted many of the wall displays and the mounts on the bulletin boards. While the exhibit was in progress the editors of the two local newspapers gave addresses to the student body; films on the subject of the making of paper were run, and Mr. M. F. Dice, vice-president of the Commercial Printing and Lithographing Co., Akron, gave an

THROUGH THE COURTESY OF THE BOARD OF EDUCATION
AND LEADING MILLS AND PAPER HOUSES A
P·A·P·E·R E·X·H·I·B·I·T
GIVEN UNDER THE AUSPICES OF THE HIGH SCHOOL PRINT SHOP
WILL BE OPEN TO THE PUBLIC AT MCKINLEY HIGH SCHOOL
BEGINNING JANUARY 31 AND CONTINUING FOR TWO WEEKS
AFTERNOONS 3:15 P.M. TO 5:15 P.M. EVENINGS 7:15 P.M. TO 9:15 P.M.
EXCEPT FRIDAYS, SATURDAYS AND SUNDAYS
ADMISSION FREE

POSTER PRINTED BY THE McKINLEY HIGH SCHOOL PRINT-SHOP, CANTON, OHIO, UNDER THE DIRECTION OF MR. CHESTER LYLE.

interesting talk on the subject of paper. In addition, many pamphlets and booklets were read by the printing classes during their recitation periods; other classes were taken through the halls and had explained to them the different displays; pupils from the grade schools visited the exhibit, as did students from the nearby schools.

Over fifty mills and paper dealers contributed to the exhibit as did also two ink houses, one type-founding company, and eleven local printing, engraving, lithographing, and electrotype concerns. The exhibit, through the courtesy of the Canton board of education, was held in the corridors of the McKinley High School.

Through these mills and paper dealers it was possible to present as complete a paper exhibit as one could desire along these lines. Not only were pictures shown telling of the progress of the manufacture of paper from the chopping of the log to the finished product, but paper and pulp were shown through bottled specimens of ingredients, pamphlets, booklets, films, electrical displays, and in articles especially written for the exhibit. Trips through the paper mill were shown step by step; large drawings were posted of the Fourdrinier machine; the story of the enameled, coated, uncoated, and machine-finish paper, beating engine, etc., was told and depicted. Color work, embossed work, engraving, steel die work, lithographing, and the story of photoengraving were shown. The value of colors in papers, foreign and mold-made papers, in fact, everything possible was secured to make the exhibit of such educational advantage that it would make its appeal to the layman as well as to the printer, engraver, or the business-man who directs advertising. No charge was made for admission and neither were the mills or paper houses charged for space. The undertaking was purely educational and without any thought of monetary gain. The newspapers had special writeups in their Sunday editions

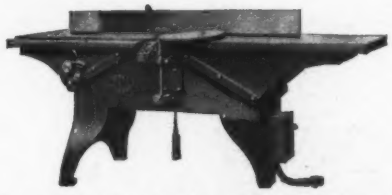
(Concluded on Page 38a)

WOODWORKING MACHINERY

PRIMITIVE WOODWORKING

History tells that, aside from the knife, the saw is the oldest known tool, coming into existence just after the end of the Stone Age. It was a crude instrument, measuring from today's standards, yet it marked the beginning of what is now one of the world's greatest industries—Woodworking. What changes have been wrought since the time of primitive woodworkers! There was work to be done, and the world's work called for better methods. Brain power was put to work in place of brawn and brute strength. Men of vision saw the world as it was to be hundreds of years later and prepared for it. Today, great machines, almost human in performance—assist men wherever they work with wood. Yates-American is proud to be a part of such a work—prouder that it pioneered in many phases of woodworking machinery development. And just as primitive woodworkers planned for today, Yates-American keeps pace and plans for tomorrow, creating new machines and improving the old, giving junior woodworkers in hundreds of manual training schools today the equipment which the industry considers as standard.

Teach your students today on the machines they will use tomorrow. Yates-American machines are recognized as the standard the world over.



No. 1 Hand Jointer handles such work as squaring, smoothing, jointing, beveling, cornering, cross-graining, etc. A valuable all around tool.

Yates-American Machine Company, Beloit, Wisconsin, U. S. A., is the world's largest woodworking machinery manufacturer. It also sells exclusively the products of the Jenkins Machine Company, Baxter D. Whitney & Son, Inc., and the L. G. McKnight & Son Company.

EDUCATIONAL DEPT., BELOIT, WIS.

YATES-AMERICAN

What is the "Web" of a twist drill?

And the "Heel"—the "Lips"—the "Body"—and just where is the "Point"? Do you know just what "Lip Clearance" means?

The "HANDBOOK FOR DRILLERS" answers every question the student of modern drilling practice must know. It tells him not only the "How" but—what is more important the "Why" of the different parts of the twist drill.

Because this booklet is both theoretical and intensely practical, it is being used by hundreds of Vocational, Technical and High Schools throughout the world as the standard textbook on drilling practice.

The "HANDBOOK" is issued by this Company, not to promote the sale of its products, but to educate prospective, and not a few **experienced,** drill users to a better and more intelligent understanding of the twist drill and its use.

Instructors are cordially invited to ask for copies of the "HANDBOOK FOR DRILLERS" in any reasonable quantities, free of charge, for the use of their students.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

*TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

VIEWS OF THE PAPER EXHIBIT HELD AT THE McKINLEY HIGH SCHOOL, CANTON, OHIO.

(Concluded from Page 36a)

as well as making displays of their own. To supplement the exhibit, plans have been completed for classes to make trips to local printing offices, newspapers, lithographing, engraving, and electrotype concerns and to a paper mill.

The exhibit was thoroughly advertised two weeks in advance of the opening. Posters, in three colors were printed by the printing classes. Invitations were sent to the superintendents of nearby schools and to many of the leading businessmen of the city. Many thousands of pamphlets were printed and distributed—the Canton Foremen's Club alone, mailing out over a thousand of the same. Speeches were given in practically all of the leading civic clubs of the city and in every way possible the exhibit was advertised.

One of the officers of the leading engraving house of the city, in the near future, will deliver a lecture telling the story of the photo-engraving business. This lecture will be held at the high school, and will be attended by the printshop boys, the printers of the city, and their friends. This lecture is an outgrowth of the exhibit. One of the great benefits of the paper exhibit has been to bring the master printers and the high-school printing department into closer relationship and to create a new interest in the printing course.

Lincoln Arc-Welding Competition. The American Society of Mechanical Engineers is conducting a prize competition which is intended to encourage improvements in the art of arc-welding in the direction of new and wider applications of the process and advantages and economies to be gained by its use. In connection with the competition, the Lincoln Electric Company, of Cleveland, Ohio, offers three prizes of $10,000, $5,000, and $2,500. These prizes will be awarded at the 1928 spring meeting of the Mechanical Engineers' Society.

The tenth annual high-school agricultural contest held at Ames, Iowa, based on vocational leadership went to the following boys: Verl Baker, Newton; Vernon Curvin, Jordan; Elmer L. Erickson, Radcliffe; Dale Gillaspey, Lamoni; Raymond Sorenson, Plymouth; Harold Ingle, Bondurant; Sam Kelso, Sewal; Lawrence Parks, Newton; and Clyde Rosenfeld, Kelley.

The United States Bureau of Education has adopted a policy whereby industrial schools for the natives of Alaska are to be encouraged. Three schools are already in operation. Included in the curriculum are such industries as housebuilding, boatbuilding, making of furniture, sled construction, operation and repair of gas engines, navigation, tanning of skins, basket weaving, and carving of ivory.

VISION!

TOMORROW'S industrial executives and leaders are being trained in your shops today. What of the equipment you are using?

We want to tell you that schools using Cincinnati M-type Millers are training their boys on the same machine which these boys later on will specify for actual manufacturing and tool-room work.

Look over your shop equipment. What could Cincinnati Millers do for you? They are modern—(Sliding Gears—Roller Bearings—Automatically Lubricated)—they're safe.

Look ahead! Have YOU visualized how much more service you can render your boys by using Cincinnati Millers? The first step toward the installation of Cincinnati Millers is to get our interesting data on this machine. Send for it, there is no obligation.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI, OHIO

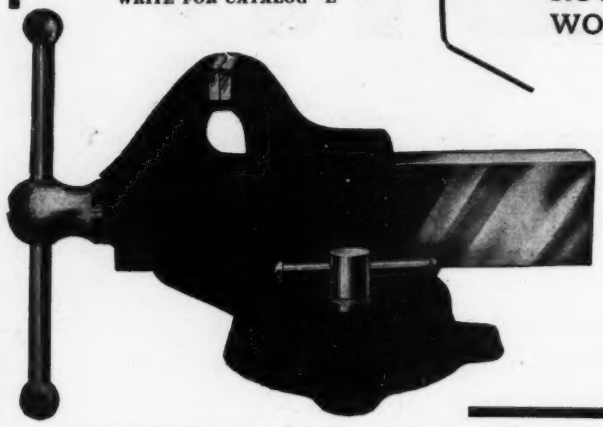
ROCK ISLAND VISES

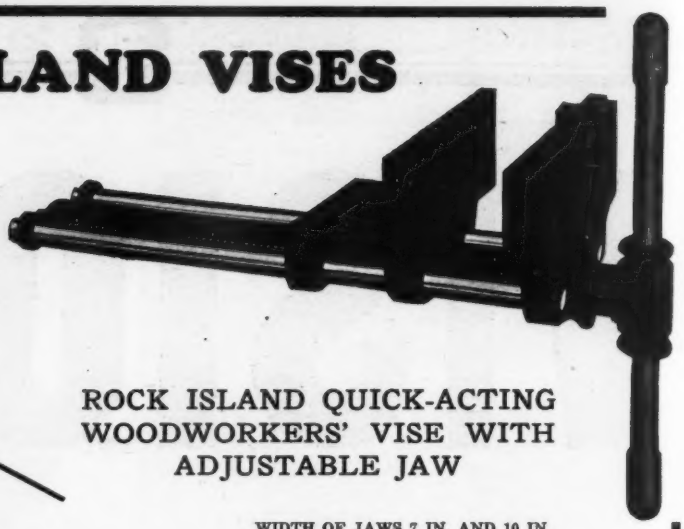
DIAMOND SWIVEL VISE

WIDTH OF JAWS 2½ IN. TO 7 IN.

A guaranteed Vise. All vital parts are reinforced. With the Clamp Bolt feature, this vise can be turned and locked in any position. The grip is positive.

WRITE FOR CATALOG "L"





ROCK ISLAND QUICK-ACTING WOODWORKERS' VISE WITH ADJUSTABLE JAW

WIDTH OF JAWS 7 IN. AND 10 IN.
DEPTH OF BOTH JAWS 4 IN.

By turning the handle upright, the front jaw can slide up against the board and with a fraction of a turn, locks the board tightly.

WRITE FOR CATALOG "L"

ROCK ISLAND MFG. CO.
Rock Island, Ill.

MAKING OF A DRESSER BOX

By Everett M. Stanley, Waterbury, Conn.

Readers of the MAGAZINE who examined the drawing of the dresser box in the issue for January, may be interested in the writer's method of handling the construction.

The side and ends are first prepared to dimensions and the half-blind dovetails cut and fitted either entirely on the bench or with the aid of a band saw. The frame is then glued together, and care is taken that it is square. The top (which is ¾" stock and not ¼") and bottom are then prepared.

Select that part of the box frame that will least separate for the cover and, placing the frame in the center of the bottom board, draw lines around to mark the inside edges. Mark bottom, box frame, and top so you will know how they were placed when marked. Now with gauge, mallet, and chisel or rabbet plane, and circular saw cut the rabbets ¼" deep so that top and bottom fit securely to the frame. Draw lines around bottom edge of frame for the bevel or chamfer planing. Plane end bevels first, taking care not to split the wood. Now mark the name, school, and year on the underside of the bottom by writing same in your best swinging style, using letters rather round in character. Take an 8-penny nail, with not too sharp a point, and tap a continuous deep impression over your writing.

Now glue top and bottom to the frame, using hand screws or clamps and blocks of wood to keep from marring the box. When the glue has set, clean the box up and lay out the bevel planing for the top. Plan the long bevels the full length of the top first, and the end bevels last.

Saw the box in two as indicated, either with hand saw or circular saw. Fit cover to box and hinge cover, using 1" brass butt hinges (⅜" flange). Set hinges in as any good door or cone hinges are set in. Put on catch. Again clean up your box and finish as any really nice box should be finished.

Red cedar is very attractive, so is mahogany, black walnut, or any good cabinet wood.

KEEPING HOUSE

By your laboratory they shall know you. All too many teachers neglect their housekeeping. Every schoolroom should tell the visitor what is taught therein. This might be called department personality. Every agricultural room should speak out in forceful terms that it is a place of farming activities. The appearance of the laboratory brings out characteristics of the teacher.

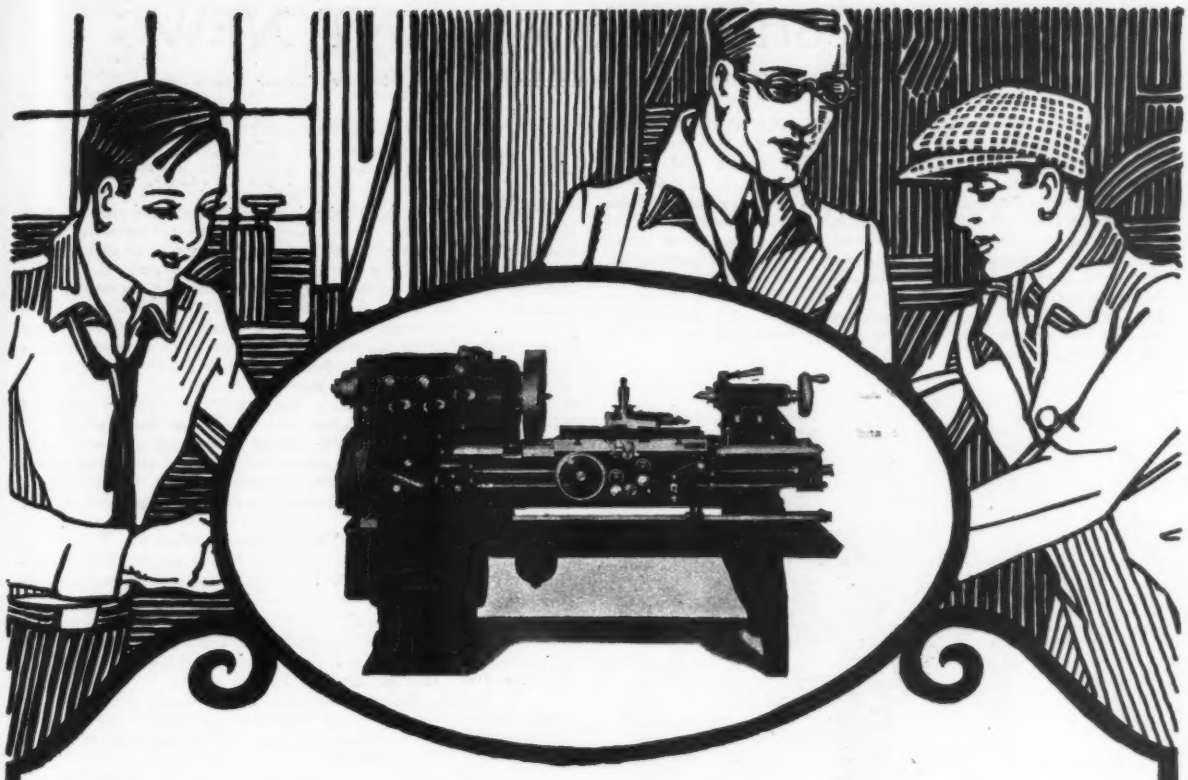
How often we find the teacher's desk littered with useless paper, advertisements, bulletins, etc. Books, pencils, reports, and paraphernalia cover the top of the desk to the depth of a foot or two. It is much easier and far more economical to have an orderly desk arrangement. A pair of attractive, inexpensive book ends to hold the books in a neat row should be secured. Papers, school reports, and plans should be kept in manila folders.

Too many agricultural departments keep their houses similar to the average barnyard. Cobs, trash, junk, broken machinery, and loose ends of innumerable, unfinished jobs clutter the workroom. The farm boy must be taught a different system. The teacher must set the example, and require his student to keep the standards he sets. The student learns to produce by actual practice.

Slovenly housekeeping sometimes permeates the whole school system. Not all the poor housekeeping is among the agricultural teachers. The school building may be untidy because the proper janitor service is not required. Superintendents' offices sometimes have the appearance of a waste basket or a community storeroom. The superintendent is a busy man; so is the agricultural teacher; so is the first-grade teacher. Your business as a teacher cannot excuse you from one of the important points of instruction. Your schoolrooms are not museums for the purpose of storing relics. They are workshops, therefore, the place to have your working tools. Each and every piece of apparatus must have a definite place in the scheme of an efficient workroom. Every teacher of the school system should make his workroom attractive.

Too much stress is laid on annual clean-up days. Every day should be a "clean-up day." There is as much sense in an annual "face-washing day" as there is in an annual "clean-up day." Each agricultural teacher should set the example for his school by making a beautiful environment. The student will learn to appreciate beauty and then carry it back to the farm home. We cannot have a beautiful farm home if the farm owners do not learn the order of natural fitness of surroundings. This is the teacher's job and it must be every teacher's business to promulgate such instruction. Every school day a clean-up day for each and every teacher!—North Dakota News Letter.

Study Cost of Shop Instruction. Supt. J. E. Burke of Boston has appointed a committee consisting of three heads of departments, to make a thorough survey of the costs of intermediate and high-school shop equipment. The committee, in connection with its study, will compile data on the cost of equipment in cities of the same size and conditions. The business manager will cooperate with the committee in making the study and reporting the findings to the school board.



Train Your Students for their Jobs — Use MONARCH LATHES

Train your students on MONARCH LATHES and when they go from your school they will be ready for their jobs —valuable men immediately without the necessity of going through another period of training in the shop.

The student that is trained on a Monarch Lathe is trained in actual shop practice — for the Monarch is the first choice of Industrial America. Today more Monarch Lathes are being sold to industrial plants than any other lathe built.

The Monarch motor-driven, helical geared Lathe is the ideal equipment for instructional purposes. It is far in advance of other lathes in design. It is as near danger-proof as any lathe can be made. It is as noiseless as any lathe can be—an important advantage in the instruction room.

Monarch Lathes are used in the Massachusetts Institute of Technology, Yale, Cornell, and in hundreds of the best technical and high schools — proof that the Monarch is the practical lathe for modern school equipment.

The success of your school and the success of your students are inseparably linked together. Use MONARCH LATHES and meet the modern demand for training that *fits men for their jobs.*

Illustration above shows 14 x 6 helical geared Monarch Lathe

THE MONARCH MACHINE TOOL CO.

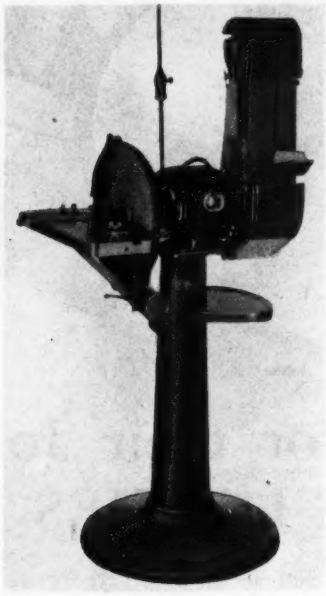
100 OAK STREET - - - - - - SIDNEY, OHIO

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

PORTER-CABLE BELT-AND-DISC GRINDER AND SANDER

The Porter-Cable combination belt-and-disc grinder and sander, manufactured by the Porter-Cable Machine Company, of Syracuse, N. Y., has been designed for school shops using the rough and finish grind at the same time. It is also useful in shops desiring to combine the advantages of both types of machines and to economize on investment and floor space. With this machine two men may work at the same time, or one may handle some jobs on both the belt and disc. In operations requiring straight-grain finish, and in those where the large table and angle gauge of the disc sander are used, the combination machine provides both types at a much lower cost than that of the individual types.



THE NEW PORTER-CABLE GRINDER.

The disc side of the machine has a large table which tilts up and down and which may be removed when using the face of the disc. An angle gauge and a core-print gauge operating in a slot makes it possible to secure compound angles and to secure a variety of curves. A vacuum dust-collecting system at the back of the disc draws out the dust and forces it out through the pedestal to the floor.

A ¾-h. p. ball-bearing motor furnishes the power for operating both the disc and the belt. The belt is driven by a 7½-in. pulley running over an idler at the top of the machine, and the belt side has a table and angle gauge which is readily removable for tilting up and down. An advantage of the belt is that pieces 18 in. in length or more may be easily sanded by removing the table and upper dust gauge and moving them back and forth along the belt. The bed under the belt may be adjusted to either a horizontal or vertical position by removing four cap screws, allowing it to be moved through an arc of 90 degrees. This feature provides three machines in one, which enlarges its capacity and makes it more convenient for certain operations.

The ball-bearing construction, as well as the substantial cast-iron frame, insures long life and absence of wear.

BUYERS' NEWS

Offers Valuable Shop Projects. The Stanley Rule and Level Plant at New Britain, Conn., is offering a new series of projects in woodworking for the home workshop. The plans have been designed by an expert manual-training instructor and are complete in every detail. They will be found helpful in any school as well as home shop.

The plans include a bill of materials, instructions for cutting, a list of necessary tools, and a clear and concise description of the procedure. Detailed drawings of the various cuts and semi-finished objects are shown. The list of plans include 25 as follows:

1. Book rack.
2. Candlestick or flower holder.
3. Pipe rack with a bracket shelf.
4. Flower box and fern stand.
5. Table lamp.
6. Toy automobile.
7. Sconce.
8. Dinner gong or chimes.
9. Bird houses, shelters and feeding box.
10. Dog house.
11. Book or magazine stand.
12. Smoking cabinet.
13. Kitchen cabinet.
14. Sewing cabinet.
15. Cedar chest.
16. End table.
17. Tea wagon.
18. Model sail boat.
19. Flat-bottom row boat.
20. Combination kitchen seat and step ladder.
21. Garden seat.
22. Garden trellis.

S70. Small tool chest.
S71. Large tool chest.
S72. Workbench.

The purpose of this service is to reach boys and men in their homes and to influence them to do useful, constructive work in the home workshop. The plans are sufficiently complete so that the boy who has not had the advantage of school shopwork or has not advanced beyond the beginner's stage will be able to successfully construct each of the objects from the plans and instructions given.

A set of the plans is offered free to all shop instructors upon request. For boys the plans are offered at ten cents each and may be obtained either from local hardware dealers or from the Stanley Rule & Level Plant, New Britain, Conn.

Sixth Annual Economic Contest. The Simonds Saw and Steel Co., of Fitchburg, Mass., has announced the sixth annual economic contest for 1927. The contest is intended to arouse a general interest in the subject of economics, as related to individual and general welfare. As in past years, fifteen hundred dollars in prizes is offered by Mr. Alvan T. Simonds, president of the Simonds Saw and Steel Company.

The subject for 1927 is "Who Ultimately Pays the Taxes?"

Communications may be addressed to the Contest Editor, Simonds Saw and Steel Co., 470 Main St., Fitchburg, Mass., not later than December 31, 1927.

Arc-Welding Manual. The use of arc-welding has become so widely applied in all industries that a thorough understanding of its elementary functions and principles of operation is essential to superintendents, foremen, and operatives.

The Lincoln Electric Company, of Cleveland, Ohio, has just issued the 1927 edition of its "Instruction Manual," which explains the installation and maintenance of the Lincoln stable-arc welder and gives methods of procedure for standard operations.

The information is not given as a specific law but as the result of research into an interesting field, and the manual has been made sufficiently comprehensive to meet all normal requirements, both of the new operator and the experienced welder.

The publication which has been revised to cover the latest practices in electric-arc welding, treats such subjects as high-speed steel welding, high-pressure pipe welding, boiler repair, welding of cast iron, manganese-steel welding, carbon-arc welding, and manufacture of machinery and equipment using welded steel in place of castings. The booklet is fully illustrated and contains a number of useful tables. It sells for $1.

Posters in Prang Showcard Colors. The American Crayon Co., of Sandusky, Ohio, has announced the preparation of a new poster which has been carried out to illustrate the use of Prang tempera showcard colors. The posters have been reproduced in bright colors making them most attractive and effective. The large macaw in bright yellow against a background of vivid blue, intermingled with green and violet, makes the effect very striking.

THE NEW AMERICAN CRAYON COMPANY POSTER.

In the design and finish of the posters great care has been taken to obtain vivid contrasts and yet obtain a perfect blending, all of which has resulted in a poster of true artistic merit. The beauty of the design and attractiveness of the finish should draw attention to it wherever it is used.

NEWS AND NOTES

The Vocational Conference at LaPorte. A vocational conference from the viewpoint of the industrial executive was held February 18 and 19, at LaPorte, Ind. The conference took up such phases of vocational work as cooperative industrial education and group apprenticeship.

The speakers on the first day were Mr. J. J. O'Brien, of South Bend, who talked on the work of the vocational schools of several cities he had visited, and Mr. Gilderman, superintendent of the Dodge Corporation, Mishawaka, who discussed the cooperative industrial plan and the apprenticeship system. Mrs. A. L. Burdick, special agent of the Federal Board for Vocational Education, made a plea for more consideration of girls and women in industry. She called attention to the fact that the average length of the working period for women has been increased from two to eight years, which calls for more systematic training of workers of this type.

Prof. O. B. Badger of Purdue University, on the second day presented the advantages of the cooperative plan to the boy and to the employer. Mr. E. Warrick, supervisor of apprentice training at the Studebaker Corporation, South Bend, Ind., gave his experience and observation in the organization of an apprenticeship program at the Studebaker plant. He brought out the fact that applicants for apprentice training must be boys of better than average intelligence and he made the prophecy that in the future only high-school graduates with some vocational training would be accepted as apprentices.

Install Pipe Bench in Plumbing Shop. The increased enrollment in the plumbing shop of the Joliet Township High School at Joliet, Ill., has made it necessary to install a new pipe bench. The boys in the woodshop recently completed a show case for the R.O.T.C. The printing shop has placed in operation its metal furnace for remelting linotype slugs. The furnace has a capacity of 700 pounds, sufficient for two issues of the school paper.

Wisconsin Vocational Guidance Association Elects Officers. The Wisconsin Vocational Guidance Association, at its recent meeting, elected officers. Mr. A. H. Hanson, of the Boys' Technical High School, Milwaukee, was elected president. Other officers are Miss Underwood, Madison, secretary, and Mr. Childs, Sheboygan, treasurer.

Furniture Construction Class. A class in furniture construction has been established at East Brookfield, Mass., under the direction of Mr. David Forest. The boys have made smoking stands, medicine cabinets, and tool chests.

Apprentice Association Formed. An apprentice association has been formed at the vocational school at Fond du Lac, Wis. Officers will be elected and a program of work outlined. Under the plan, indentured apprentices of any trade are eligible for membership in the organization.

Bird-house Contest. A bird-house contest has been arranged at Erie, Pa., with the cooperation of boy scout leaders, manual-training teachers, and others interested. The aim of the contest is to interest boys and girls in the necessity for protection of bird life to maintain vegetation and crops.

Rural Vocational Work Improved in Virginia. A recent report of the state superintendent of public instruction of Virginia shows that there are 88 more full-time vocational agriculture departments in Virginia high schools than there were in 1917-1918. During the earlier period there were only eighteen full-time periods of agricultural education in high schools. Now there are 106. In addition to these classes, instruction was offered during the past session in 38 rural high schools located near certain full-time departments.

A comparison of the records during the past session over 1924-1925 shows that there are seventeen more full-time departments, with 48 evening classes and five part-time groups. The enrollment for the last year showed an increase of 481 students in full-time work, 657 in evening and 46 in part-time classes. The total enrollment in all types of schoolwork was 3,702, an increase of 1,150, which is thirty per cent over the enrollment of the previous year.

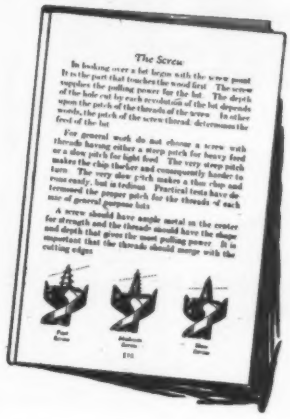
During the past session a start was made in meeting the needs of a group of boys, 20,000 in number, between 14 and 20 years, who live on farms but who have dropped out of school. Forty-eight of these boys were persuaded to come into the agricultural departments of the high school during the slack season, with very encouraging results.

Wins Union Pacific Prize. Ben Kohrs, a student in the Abilene, Kans., high school, recently won the Union Pacific Railroad prize of a $100 scholarship for his work in vocational agriculture. A year ago he won the Rock Island prize, a trip to the national stock show at Chicago.

Vocational Expenditure Passes $12,000. The vocational department of the Oklahoma City schools has presented a claim to the state vocational department which shows a total expenditure of $12,618.35. This is an increase of $2,500 over the vocational expenditures for last year.

Printing Mottoes. The printshop of the Liberty High School, Bethlehem, Pa., is rendering the high school, and in fact, the entire school system of Bethlehem, service in preparing and printing mottoes to be mounted on the school bulletin boards. The mottoes are selected to suggest some desirable attitude toward schoolwork and life, and

Every Manual Training Instructor should have a copy of this free BOOK!



MANUAL training instructors will find this illustrated 48-page booklet a real help in promoting class interest and an appreciation for good tools.

Between its covers is a wealth of interesting and authoritative data based upon 41 years' experience in the bit making industry.

There are detailed illustrations showing how bits are forged and machined, the parts of a bit and their functions, how to sharpen a bit properly, how to re-straighten the twist, and how the design of the cutting head is varied to meet the requirements of different classes of work.

Please return the coupon and we will be glad to mail you a sample copy free of charge.

THE IRWIN AUGER BIT CO.
WILMINGTON OHIO

Largest Makers of Wood-Boring Tools in the World.

THE IRWIN AUGER BIT CO.,
WILMINGTON, O.

Please send me a sample copy of booklet, "How to Select, Use and Care For Bits."

Name.....

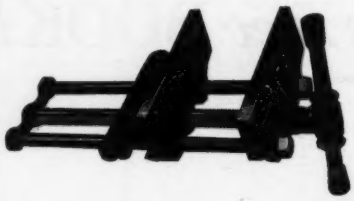
School.....

City and State.....

Morgan Vises for Machine and Wood Shops

QUICK ACTION WOODWORKER'S VISE

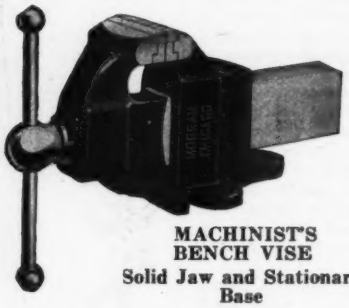
(TOLES PATTERN)



The MORGAN line of Vises for Manual Training Schools is most comprehensive in its scope. A style and size for every department.

MORGAN VISES GUARANTEED TO GIVE YOU THE SATISFACTION YOU HAVE A RIGHT TO EXPECT.

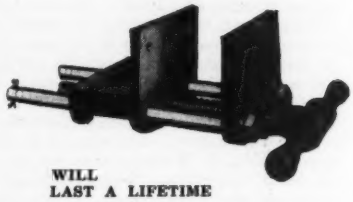
The vise shown below illustrates our No. 40 - 4" Machinist's Bench Vise (Weight 43 lbs.) recommended for all Metal working departments.



MACHINIST'S BENCH VISE
Solid Jaw and Stationary Base

SEND FOR OUR CATALOG No. 26 ILLUSTRATING OUR complete line.

SOLID NUT-CONTINUOUS SCREW VISE



WILL LAST A LIFETIME

Our SOLID NUT-CONTINUOUS SCREW VISE (SHOWN ABOVE) has solved the vise problem in hundreds of schools, both in the United States and Canada.

MORGAN VISE COMPANY, Mannual Training Department.
558 WASHINGTON BLVD., CHICAGO.

are chosen from the works of great thinkers and authors. Each of the mottoes is used as an opportunity for studying type display, the selection of stock, and color combinations.

A foremen's conference lasting two weeks was held under the direction of C. M. Miller, state director of vocational training at Topeka, Kansas. The foremen are identified with the local industries and the railroads.

The tenth annual high-school agricultural contest held at Ames, Iowa, broke all records. There were 133 judging or demonstration teams, 75 instructors, and 500 persons present.

The vocational agricultural school at Chickasha, Oklahoma, made a profit of $803.29 in the sale of projects, which was divided among nine students. The projects include cotton, cane, dairying and poultry.

At Taycheedah, Wis., a class has been formed which busies itself with repairwork in and about the schoolhouse. Last spring the class made a dozen bird houses; with an earlier start this year the members expect to turn out some "real fancy" bird bungalows and apartment houses, and not a few of them, but enough for a whole city of birds.

The agricultural vocational school at Grandfield, Oklahoma, will introduce a course on tractor repairs.

The board of education of Monroe, Mo., has adopted a resolution endorsing vocational agriculture and opposing the 50-per cent cut in appropriation recommended by the state tax commission. The resolution says that "vocational agriculture has paid more in dollars and cents as shown by the profit of the boys' projects than it has cost."

The girls at the manual-training school at Memphis, Tenn., are learning to weave rugs and the boys brushmaking. The school system uses thirty dozen floor sweeps and eight dozen counter brushes a year, which the students propose to make.

The Indiana Vocational Meeting. The Indiana Vocational Association cooperated with the vocational division of the State Education Department in holding a conference on vocational education February 25 to 26, at Indianapolis.

The first day of the conference was given to discussions of problems connected with the general administration of the work. Mr. L. L. Needler, secretary of the Indiana Farm Bureau, discussed the subject, "The Relationship of the Indiana Farm Bureau to Vocational Education." "The Program of Vocational Education in the Bedford, Indiana, Schools" was discussed by Mr. M. H. Abbett, superintendent of the Bedford schools. Mr. W. A. Siler, of the Remy Electric Mfg. Co., of Anderson, talked on "The Cooperative Plan in Vocational Education."

The second day, February 26, was devoted to a number of sectional meetings. The industrial group resumed a discussion of the cooperative plan, with Mr. C. D. Rotruck of Anderson, and Mr. G. J. Mason of Evansville, as leaders.

The home-economics teachers and supervisors held a sectional meeting, discussing the subject, "The Problem Method of Teaching." Miss Helen Bosard of West Lafayette, Miss Agnes Watson of Freelandville, Miss Ozark Palin of Plymouth, and Miss Elsie Glasgow of Sanborn, were the leaders in this discussion. Mrs. Louise Huston, of New York, took part in the program.

The conference was a success both in interest and attendance.

Vocational Education in Virginia Coal Fields. Each year sees some new form of vocational education developed in the coal fields of Virginia. An elaborate program of foremanship training was introduced two years ago and is still functioning. Last year a comprehensive program of teacher training for store managers was introduced and today these managers are still conducting monthly conferences with their sales forces using the methods advocated by the state board for vocational education.

The latest development in vocational education in the coal fields is an intensive teacher-training course for teachers of mine safety and accident prevention. This is a program sponsored by the Virginia Coal Operators Association cooperating with the Virginia State Board for Vocational Education and the United States Bureau of Mines. Twenty-three safety men and leading foremen were selected from thirteen companies operating in the field and were during March, 1927, in session at Norton, Virginia, attending a three weeks' intensive teacher-training course. The instruction in the technical phases of mine safety was taught by Mr. E. H. Graff, specialist in the Norton Station of the United States Bureau of Mines, who also assisted the men in organizing the subject matter of mine safety and accident prevention into a course of study. The teacher-training phases of the work were taught by Mr. B. H. Van Oot, state supervisor of trade and industrial education, and Mr. D. M. Borum, specialist in foremanship training of the state board. Upon the completion of this course the men returned to their respective companies to organize evening classes in mine safety and accident prevention. These classes will be under the supervision of the state supervisor of trade and industrial education.

New Vocational School at Beloit. A site has been purchased for a vocational school to be erected at Beloit, Wis., at a cost of approximately $150,000.

(Continued on Page 48a)

Built for master craftsmen . . . Best for school workshops

Sargent Clamps Nos. 13, 16 and 22

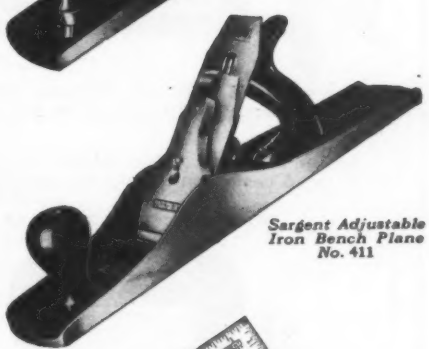
THE Sargent tools featured on this page were carefully adapted for manual training use from tools which carpenters and woodworkers have used for years. For more than half a century the Sargent name has been a guarantee of excellence. It is applied to Sargent goods only when they have satisfied every requirement. It is on the four tools pictured here.

Ease of adjustment puts the Sargent Auto-Set Bench Plane in a class by itself. Its cutter of keen edge-holding chromium steel may be removed, sharpened and replaced without changing the original adjustment. Yet in place, the cutter is absolutely rigid—non-chattering even across or against the grain. No. 711 (11½ inches long, 2-inch cutter) is just the right size for your students. It is much lighter than old-style planes of same size. It is exceptionally roomy around the grips, and so strongly built that it should never have to be replaced. The 411 Plane is probably the most serviceable and desirable plane of this type ever offered to manual training students.

Sargent squares are universally admitted to be the most complete and most helpful on the market. Although they are made in every practical style and for many special purposes, the 30N and 30B have been found to be especially suitable for most school uses. Both have a body 18 x 1½ in. and a tongue 12 x 1 in.

Sargent clamps are strong, finely fitted and finished. The screw is steel; the head and swivel, malleable iron. We especially recommend to you Nos. 13, 16 and 22, which open to 3, 6 and 12 inches. Sargent tools are sold by hardware dealers almost everywhere. See them there and write us for catalog and particulars.

Sargent Auto-Set Bench Plane No. 711

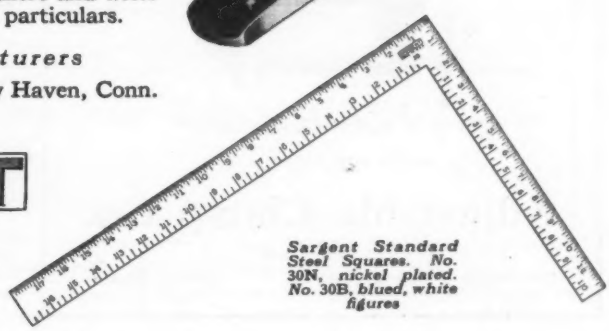


Sargent Adjustable Iron Bench Plane No. 411

SARGENT & COMPANY, *Manufacturers*

58 Water Street New Haven, Conn.

SARGENT
Tools & Hardware



Sargent Standard Steel Squares. No. 30N, nickel plated. No. 30B, blued, white figures

Genuine

TRADE MARK
"Jorgensen"
REG U S PAT OFF

"The Stamp of School Approval"

The "JORGENSEN" has proven its extraordinary fitness for school service.

Every *genuine* "JORGENSEN" has that name conspicuously stamped on the side of the jaw.

"MARK" CARRIAGE CLAMPS

The word "MARK" on Malleable "C" Clamps identifies clamps of this type of the most economical service.

They also belong to our family of clamps, and their good conduct in service is warranted by us.

"MARK" MACHINIST'S CLAMPS

"Who is YOUR Clampmaker?"

WRITE FOR CATALOG 6EE

Adjustable Clamp Co.

Established 1903

424 North Ashland Avenue Chicago, Illinois

(Continued from Page 46a)

Begin Movement for Trade School. The open-shop directors of the Oklahoma chamber of commerce are supporting a movement for a new trade school in order to offer better facilities for trade training.

Detroit Boy Wins Model Airplane Trophy. The William B. Stout duralumin trophy for the first national indoor model airplane contest held March 21, was won by Charles Dybvig, a Detroit boy. It was indicated after the contest that several of the winning models would very likely be sent to England for the international contest to be held next summer at Wembley.

The Detroit contest established no new records. Fifty miniature planes were entered by 35 students, principally from New York City, Chicago, and Detroit. The prize winner's plane made a successful flight of 160 seconds, which is 13 seconds short of the world record held by another Detroit boy. The second place in the contest was won by S. G. Brady, another Detroit student, and the third place by Earl Nellis of Wyandotte, Mich. While the contest was sponsored by the Detroit News and the Detroit Air Board, leadership was taken in reality by the manual-arts department of the Detroit schools. Mr. Merrill C. Hamburg was actively in charge of the preliminary contests for the Detroit city schools.

Manual-Training Class Constructs Ash Trays. The members of the Lions Club of Las Animas, Colo., were recently presented with ash trays made by the manual-training class in the local schools. The ash trays were made with an ornamental wood base, beautifully designed and finished. The glass tray in the center contained the Lion emblem in color. The work was done by pupils in the seventh to the tenth grades and was a token of appreciation for what the members of the club had done in giving medals to the schools for excellence in various branches of schoolwork.

Establish School of Design in Grand Rapids. The establishment of a school of design at Grand Rapids, Mich., has been made possible through a bequest of approximately $200,000 in the will of the late Mrs. David Kendall, widow of one of the city's talented furniture designers. The Kendall home is to become the home of the school and it is planned to furnish several of the rooms in the same style in which they were designed by the late owner.

Accept Prize Poster. A prize poster giving publicity to the forthcoming convention of the Eastern Arts Association at Philadelphia has recently been completed. The poster is in three colors and has been reproduced and sent to the members of the Association through the special courtesy of the American Crayon Company, Sandusky, Ohio.

Contest in Sheet Metal. The Peck, Stow & Wilcox Co., of Southington, Conn., has announced a contest for sheet-metal students, as a means of promoting student interest in the sheet-metal industry and exercising good judgment in the care and handling of tools and machines of the craft. The competition is being conducted in connection with the celebration of the 108th anniversary of the establishment of the company.

The test to determine the winner may be undertaken by the city director of vocational education, the state supervisor of vocational education, or by a committee composed of both local contractors and labor groups.

The prize offered is a handsome medal which certifies that the holder has qualified in the expert operation of machines and tools of the sheet-metal craft.

Offer Cooperative Textile Course. The State Trade School of South Manchester, Conn., has cooperated with the Cheney Silk Mills in offering a cooperative textile course. Under the plan adopted, students work two hours on school days at Cheney Brothers' weaving departments for a total of ten hours a week. Students who take the course are paid according to the following plan: 25 cents per hour for freshmen and sophomores; 25 cents for juniors, and 30 cents for seniors. Students who become eligible to the honor roll receive bonuses of five cents per hour. Students who are backward in classwork are not paid for their work.

The course makes it possible for students to take advantage of the opportunities offered to technically trained workmen at the mills. There are at present several trade-school graduates holding good jobs at the mills, and some are in line for promotion to foremen and assistant foremen.

Cooperative Commercial Course Offered. A cooperative commercial course is being offered to high-school students at Atlanta, Georgia, under the auspices of the Atlanta schools and the local retail merchants' association.

The class is composed of fifty or sixty students of the commercial department who spend half of their time in study in school, and the remainder in selling and commercial work in the local stores. It is planned to extend the system to take care of additional students.

Stress Progress of Individual. The administrative department of the Essex County Boys' Vocational School at Newark, N. J., has introduced a change in methods which seeks to stress the progress of individual students. Under the present plan, the pupils advance in large classes and little opportunity is afforded for stressing the talents

(Continued on Page 50a)

It's *for* you!

THIS useful catalog of nearly 500 pages is a veritable encyclopedia of information. It will be sent free to Purchasing Departments of Manual Training Schools or to Supervisors and Teachers interested in the selection of suitable tools and supplies for the metal working industrial arts.

Fill in and mail the coupon below
or write

WILLIAM DIXON, INC.

32 EAST KINNEY STREET, NEWARK, N. J.

NEW YORK SALESROOM, 119 FULTON STREET

DIXON CATALOG WORTH LOOKING INTO

I.A.M.

WILLIAM DIXON, INC., 32 EAST KINNEY STREET, NEWARK N. J.

Send a copy of your new Edition CATALOG to

NAME _____

ADDRESS _____

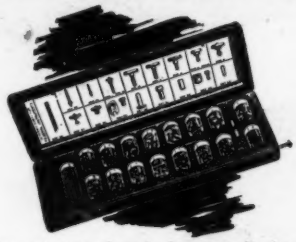
NAME OF SCHOOL _____

PLEASE STATE WHETHER YOU ARE PURCHASING OFFICIAL OR INSTRUCTOR _____

DIETZGEN

Standardization of Parts — the feature which has made Dietzgen Drawing Instruments preferred by Schools and large industrial organizations

Universal Drawing Instrument Set No. 1056-C—especially popular and well designed for school use.



The repair outfit shown has been especially designed to service a large number of sets of one grade. It will add years of life and usefulness to school equipment.

All Dietzgen drawing instruments are made in our own factory and are accurately and carefully standardized, both for producing high quality instruments at low cost and for the benefit of users who are thus assured long and satisfactory service through ability to secure fitting replacement parts at any future time.

This is extremely important to schools because they can obtain at any time either at our branches or large dealers, accurately fitting parts for instruments at very reasonable prices.

Write for descriptive literature regarding drawing instruments and repair kits. Address our nearest branch.

EUGENE DIETZGEN CO.

Enduring worth at reasonable cost

Chicago New York New Orleans Pittsburgh San Francisco Philadelphia Washington Milwaukee Los Angeles Factory at Chicago

DIETZGEN EST. 1885

Drawing, Surveying & Mathematical Instruments & Materials, Measuring Tapes

(Continued from Page 48a)

of the bright boy or for getting rid of the shortcoming of the mediocre or backward boy who has been handicapped by poor environment.

Under the plan worked out, the difficulties have been largely overcome so that each boy progresses according to his own particular ability. . The plan lays stress on the individual and the small group, which is a desirable condition. The element of time is a flexible proposition with boys finishing up their required work at various times during the year.

The plan also has the advantage of economy, since the student who completes his quota of work in the shop and classroom before the usual time allotted will automatically make room for a new pupil in advance of the regular graduation period.

Dressmaking Classes Do Fine Work. The millinery and dressmaking pupils in the Girls' Vocational School at Newark, N. J., point with pride to their fine records in these two lines. At each exhibit of the school, the products of the pupils readily attract the public resulting in quick sales. This year the classes have added to their accomplishments the making of children's dresses and hats. An artistic touch was added by the arrangement of attractive flowers, also designed and made in the school.

The business men of New York City favor the continuation-school idea. A series of expressions were gathered by the Central Commercial Continuation School and published in pamphlet form. The consensus of opinion is that the continuation school makes for greater efficiency among office employees. Some of the employers find "that while it is a hardship to give up work for a half a day, we believe it is to their advantage and ultimately to ours."

Broadcast Facts on Agricultural Education. On the evening of February 23, a program of agricultural education was broadcasted from Station KFAB, Lincoln, Nebraska. The program was of particular interest to agricultural students in Smith-Hughes schools and classes and consisted of a number of addresses by leaders in state agricultural work. Among those who took part on the program were C. A. Fulmer, state director of vocational education; J. H. Pearson, state supervisor of agricultural education, and E. A. Burnett, dean of the college of agriculture and president of the state board of vocational education.

North Dakota Assn. Passes Resolution to Put Manual Training Back Into Its Schools. At the last meeting of the North Dakota Teachers' Assn., which was held at Fargo, a resolution was passed asking that manual training be again placed in the school curriculum of the North Dakota schools. Manual training was discontinued in the smaller schools several years ago due to financial depression in which the state found itself.

Boys Construct Surface Gauge. The machine-shop class of the evening school at New Kensington, Pa., recently completed a surface gauge. The gauge consisted of 23 plates, which were made from scraps of steel. The making of the tool requires work on the lathe, drill press, shaper, and milling machine, in addition to hours of careful filing and fitting.

Vocational Evening School. A vocational evening school was conducted at Meridian, Miss., with courses in electricity, drafting, automobile mechanics, and bookkeeping.

Additional Space for Automobile Mechanics. The school board of Elgin, Ill., has rented a barn in the rear of the high school for use of the automobile-mechanics classes. The barn provides space for the storage of automobile chassis and parts during cold weather. During warm weather the barn will be used as a laboratory for classes in automobile mechanics and repair.

Evening Art Class. An evening art class was conducted at Wausau, Wis., during the past season, with work in painting, drawing, and designing. The classes offered practical instruction for beginners in art and advanced work for those in need of additional instruction.

Spanish, Day, Trade School. A Spanish, day, trade school for Mexicans has been conducted in Los Angeles, Calif., for the teaching of automobile mechanics and engineering, as well as the business side of the industry. The class is composed of thirty students and the instruction is in Spanish. Several of the students hold scholarships and will return to their own towns as instructors in automobile mechanics.

Survey of Vocational Work. A survey of vocational work at New Castle, Pa., was recently conducted by a group of six trained experts in vocational lines. The survey sought to determine the best means for cooperation between local industrial organizations and the schools and the introduction of a practical plan for advancing education along industrial lines. The survey was carried out at the suggestion of Dr. L. H. Dennis, deputy superintendent of public instruction, and with the cooperation of the members of the board of education, the superintendent of schools, and interested school patrons.

Practical Homemaking Instruction. Approximately 100,000 girls are under instruction in the homemaking departments of the

(Concluded on Page 53a)

(Concluded from Page 50a)

New York City public schools, learning the fundamentals which are of immediate value to them in the home and the community, according to Martha Westfall, director of the department. In the elementary schools, emphasis is placed on the skill to do the simple household processes and the establishment of good health habits.

Vocational-Training Maintenance. Civilian vocational education in the United States during the fiscal year ending June 30, 1926, cost a total of $23,179,641, and vocational rehabilitation of disabled citizens cost a total of $1,185,705, according to J. C. Wright, director of the Federal Board for Vocational Education. Of the $23,179,641 spent for vocational training during the fiscal year 1926, the states contributed $6,148,942. There were 9,651 students enrolled in trade and industrial schools, 6,193 in home-economics schools, and 3,929 in agricultural schools.

Train Retail Salesmen. Training of boys and girls for retail salesmanship in the Worcester, Mass., schools has proved a success and the city's work has been commended by the Federal Board of Vocational Education in announcing the results of a national survey of the work of cities in this field. A worth-while type of training course has been conducted for the past two years at the David H. Fanning Trade School, Worcester, Mass., with the result that the merchants frankly admit that the trained graduate of the public-school course in salesmanship is a better worker than an untrained employee. More stores have cooperated with the school and each year the school is asked to supply more workers for the stores.

National Poster Competition. The National Poster Art Alliance of New York City, has announced a nation-wide poster competition for an American Legion poster, in which artists will be asked to submit designs. The contest which opened March 1, closes August 15, and is open to all artists. Three prizes are offered as follows: First prize, $1,000; second prize, $300; and third prize, $200.

The jury of award comprises such important persons as Lorado Taft, John J. Pershing, Norman Rockwell, J. O. Brubaker, William MacLean, Willy G. Sesser, and Charles Dana Gibson.

Annual Reunion of Oswego Boys' Association. The 27th annual reunion and dinner of the Oswego Boys' Association was held on Saturday, February 19, at the Hotel Wentworth, New York City. The spirit and traditions of the Oswego Normal School were expressed by members from Connecticut, New Jersey, and New York.

Vocational Agriculture. Of the 95 counties in Tennessee state, vocational agriculture is already established in 62, with 107 teachers. Many part-time and evening classes have been conducted for farmers and farm boys, according to the annual report for 1925-26, just issued.

Schools Hold Open House. A series of community meetings have been held in the junior high schools of San Antonio for the purpose of explaining the objectives of the schools to parents. Shops and other laboratories were opened for inspection. The junior schools have circulated a valuable exhibit of 150 paintings for study and display.

The Boston Manual Arts Club was organized about thirty years ago by the women manual training teachers of the city. The meetings have been held once a month. Often some one outside the club addresses the members on a subject pertaining to their work or on some topic of general interest.

The last meeting was a banquet held at Hotel Victoria, the president, Miss Celia B. Hallstrom, presided in her usual efficient and gracious manner. Miss Hallstrom is one of Boston's pioneer teachers in the manual training field. At the same time she is one of the youngest in enthusiasm, sympathetic insight into boys' interests, and in masterfulness in putting over the subject in hand.

Other officers of the club are vice-president, Olive I. Harris; secretary, Aimee Ferson; treasurer, Grace M. Sawyer, with chairmen of committees as follows: Program, Grace E. Hayden; social, Ellen F. Coffin; legislative, Mary E. Doyle; flowers, Mabel F. Alden.

Vocational Work Effective. Sixty-one classes in vocational training were conducted in Pueblo, Colo., in 1926 through the cooperative efforts of the Colorado Fuel & Iron Company. Over 4,500 persons attended the classes, which met for a total instruction of almost 3,000 hours. The total cost of conducting the classes was $11,344, of which $6,572 was paid by the state and federal board, and $4,772 by the local school board.

Automotive School. The automotive trades school in the industrial arts building of the Withrow high school, Cincinnati, offers a two-year course for boys desiring to enter any of the many phases of the automobile trades. The training offered is broad and fundamental and the graduates have no trouble finding work in their chosen line. Practically all of the graduates are working in the automobile trade in the city.

The machine shop is fitted to do all necessary machine operations, and many special machines have been built by the boys. The electrical shop and the battery department contain up-to-date equipment. The general equipment of the school consists of every type of automobile, engines, axles, and chassis parts. The subjects for study cover automotive trade work, English, science, mathematics, civics, and accident prevention, mechanical drawing and sketching, electricity, and commerce and industry.

Hyatt Bearing in Heavy Fly-wheel

Will Cut Paper 30½ and 34½ Inches

DIAMOND Power Cutters

are Rapid, Powerful, Durable, Accurate, Convenient, Safe and Most Attractive

Diamond Cutters are also made as Lever Cutters to which Power Fixtures can be easily attached

Send for full information regarding Diamond Cutters and for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Advance Lever Paper Cutters
Lee Two-Revolution Cylinder Press
Hoerner Combination Type-High Machine
Challenge Addressing Machine
Mercantile Addressing Machine
Sieber Adjustable Hand Punch
Challenge Proof Presses
McGreal Combination Printers' Chases
Challenge Labor-Saving Iron Furniture
Challenge Mammoth Iron Furniture
Challenge Notched Iron Furniture
Challenge Semi-Steel Imposing Surfaces
Challenge Pressed Steel Galleys
Challenge Rigid Rim Galleys
Challenge Iron Sectional Blocks and Hooks
Challenge Type-High Gauges
Challenge Quoins and Keys

The Challenge Machinery Co.

GRAND HAVEN, MICHIGAN

Chicago, 17-19 E. Austin Ave. New York, 220 W. 19th St.

Train Them in Economical Production

with the

KLUGE FEEDER

Student printers should be taught to take advantage of every factor which makes for increased production at lower cost.

In the job printing business the best assistant they can have is a Kluge feeder. It is simple and efficient in operation and almost human in action.

Write us for further information.

Brandtjen & Kluge, Inc.

Manufacturers

Saint Paul, Minnesota

Branches

with operating exhibits

New York, Chicago, St. Louis, Detroit.

12x18 Kluge Craftsman Efficiency Unit

PERSONAL NEWS

Mr. F. Dean Bradley, formerly director of trade education at Carson City, Nev., has become special agent for the Federal Agent for Vocational Education in the field of industrial education. Mr. Bradley's headquarters will be in Washington, and he will have supervision over eleven western states.

Mr. Walter W. Anderson has been appointed State Director of Vocational Education for Nevada.

Mr. A. E. MacArthur has been appointed Director of Trade Education for Nevada, to succeed Mr. Bradley.

Mr. Donald Cameron has been appointed supervisor of evening classes at McGill, Nev., to succeed Mr. MacArthur.

Mr. Frederick J. Allen, editor of the Vocational Guidance Magazine and author of vocational books, died at a Cambridge, Mass., hospital in February. Mr. Allen was educated at Dartmouth and took postgraduate work at Harvard. He was assistant director of the Bureau of Vocational Guidance at Harvard and had been editor of the Vocational Guidance Magazine since 1922.

Mr. Samuel E. Crockett of Menasha, Wis., has been reappointed as director of vocational education.

Mr. M. W. Smith of Wichita, Kans., has resigned to take up the duties of state supervisor of trades and industries of the state education department.

Vice-President Paul J. H. Hollberg of the Belleville, Ill., board of education recommends the establishment of a vocational school for Belleville and Nutley.

K. G. Smith, state director of vocational training for Michigan, recently delivered a public address at Bay City before a business men's body in which he pointed out the importance of equipping the rising generation with manual skill.

Mr. H. M. McClelland of Stanford University, California, has been appointed instructor and coordinator in commercial work by the Berkeley part-time high school. Another addition to the school staff is Mr. W. T. Hicken of Utah.

Mr. Henry F. Reichers, principal of the Manual-Arts High School at Moline, Ill., died on February first at his home after an extended illness.

Mr. T. G. Murray has been reelected as president of the board of industrial education at Madison, Wis.

Dr. Bradford Knapp has been appointed as president of the state board of vocational education of Oklahoma, to succeed Mr. M. A. Nash.

GAVEL PRESENTED TO SUPERINTENDENT CONDON

The manual-training department of the Dallas, Texas, schools constructed a gavel and block which was presented to President R. J. Condon during the convention of the Department of Superintendence in Dallas.

The gavel was made of materials having a close relation with great events in the history of the nation. It was made from an old oak under which the Texans fought in 1836, in the war for independence. The wood from the oak tree was sent to Supt. N. R. Crozier by Colonel Andrew Jackson Houston, a son of General Sam Houston, who was in charge of the Texas army. The head of the gavel contains a walnut star representing the Lone Star state. The star was made from the stock of a gun carried by a Texas boy in the world war.

The sounding block is also made of oak. It was made of the wood of the first log cabin erected in Dallas county.

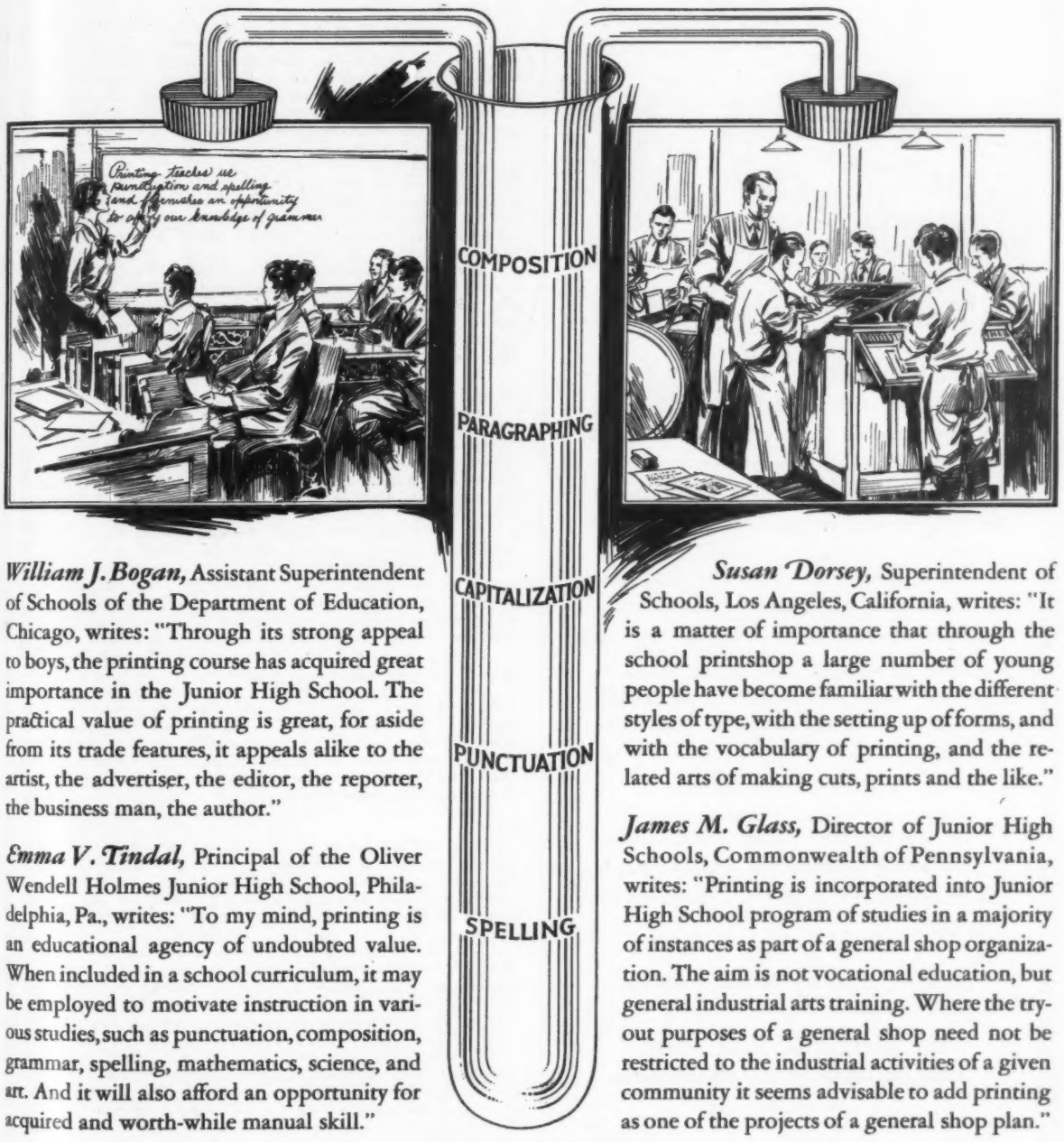
TENPENNY NAIL'S NAME GOES BACK TO DAYS OF IMPERIAL ROME

Manufacturers of nuts, bolts, screws, nails, and other mechanical appliances in their efforts at standardization of names, numbers and sizes of their products have often been puzzled to account for the name or other designation identifying a particular thing. Often these names bear little or no apparent relation to the idea they are supposed to express. It would seem to be a matter of etymology rather than of business. Nails, for instance, are made and sold in various sizes under the designation of "pennies." It is a far cry from a penny—a piece of money—to a nail. There is apparently no relation between the two except, of course, in the matter of price, a general relationship applying to all articles bought and sold.

The penny system of designating the size of nails comes to the west by way of England. There are two explanations of its origin. One goes beyond early Saxon England to Imperial Rome. The Romans had a coin, the denarius, the abbreviation for which was "d." This abbreviation came into use in Britain for the pound weight. The "d" also is the modern abbreviation for the English penny. Its use in connection with nails is traced through the belief that in early days in Britain one thousand tenpenny nails—that is, nails of a certain size—weighed ten pounds. The other explanation is that one hundred nails of a designated size costs sixpence, one hundred of another size, tenpence, hence the names sixpenny, tenpenny nails, and so on.—*American Architect.*

THE TEST OF PRINTING

The Conclusions of Prominent Educators



William J. Bogan, Assistant Superintendent of Schools of the Department of Education, Chicago, writes: "Through its strong appeal to boys, the printing course has acquired great importance in the Junior High School. The practical value of printing is great, for aside from its trade features, it appeals alike to the artist, the advertiser, the editor, the reporter, the business man, the author."

Emma V. Tindal, Principal of the Oliver Wendell Holmes Junior High School, Philadelphia, Pa., writes: "To my mind, printing is an educational agency of undoubted value. When included in a school curriculum, it may be employed to motivate instruction in various studies, such as punctuation, composition, grammar, spelling, mathematics, science, and art. And it will also afford an opportunity for acquired and worth-while manual skill."

Susan Dorsey, Superintendent of Schools, Los Angeles, California, writes: "It is a matter of importance that through the school printshop a large number of young people have become familiar with the different styles of type, with the setting up of forms, and with the vocabulary of printing, and the related arts of making cuts, prints and the like."

James M. Glass, Director of Junior High Schools, Commonwealth of Pennsylvania, writes: "Printing is incorporated into Junior High School program of studies in a majority of instances as part of a general shop organization. The aim is not vocational education, but general industrial arts training. Where the tryout purposes of a general shop need not be restricted to the industrial activities of a given community it seems advisable to add printing as one of the projects of a general shop plan."

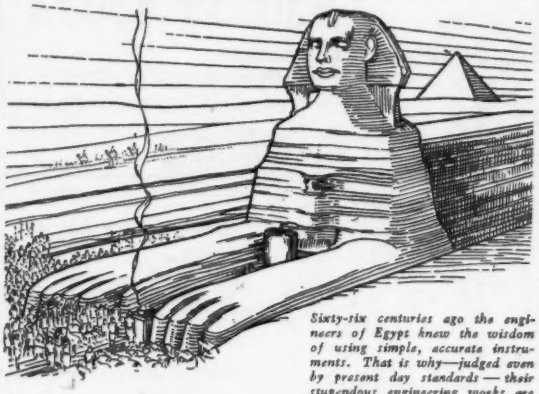
FOR INFORMATION REGARDING PRINTING INSTALLATIONS, WRITE

F. K. PHILLIPS, *Manager,* EDUCATION DEPARTMENT

AMERICAN TYPE FOUNDERS COMPANY

THREE HUNDRED COMMUNIPAW AVENUE, JERSEY CITY, N. J.

ACCURATE SIMPLICITY



Sixty-six centuries ago the engineers of Egypt knew the wisdom of using simple, accurate instruments. That is why—judged even by present day standards — their stupendous engineering works are noted for precision.

WEBER-Sphinx Drawing Instruments are extremely accurate—yet they are so simple in construction that they cannot easily get out of adjustment. Truly they are instruments you can **trust.**

Each WEBER Instrument has years of usefulness built right into it. Each instrument has been designed for the maximum of service and the minimum of bulk and weight. WEBER Instruments rest lightly — in your hands, and on your nerves. It is a pleasure to work with them.

Other WEBER Precision Instruments are Planimeters, Pantographs, Slide Rules, T-Squares, Triangles and Scales.

Send for our Catalog. Address Dept. I.A.

F. WEBER CO., Inc.
1220 Buttonwood St., Philadelphia

BRANCHES:
705 Pine St. St. Louis
125 S. 12th St. Philadelphia
227 Park Ave. Baltimore

WEBER
Drawing Instruments & Materials

Since 1854

NEW BOOKS

Individual Instruction Sheets

By R. W. Selvidge. Cloth, 263 pages, illustrated. Price, $2.50. The Manual Arts Press, Peoria, Ill.

The use of the instruction sheet as a device for teaching trades and various phases of manual arts has grown prodigiously, especially since the close of the war. In the present book, one of the earliest advocates of instruction sheets has carefully analyzed the psychological and pedagogical principles involved in the construction and use of the various types of sheets and has presented their main advantages, their shortcomings, and their uses.

It has seemed to us that we are only at the beginning of the development of instruction sheets, and that most of the sheets now in use are experimental and are likely to be changed beyond recognition within the next five years. The danger of having instruction sheets supplant the well-prepared instructor of routinizing and formalizing instruction, and of making trade instruction static rather than a vital, growing, and expanding process, is still with us. Occasionally operation and information sheets and job sheets are the sole means of aiding a poorly prepared or lazy instructor to "get by."

A book like the present will do much to overcome these dangers and abuses because it clearly points out the fact that the job sheet and the instruction sheet are valuable aids to instruction but nothing more, and that they require constant restudy and readjustment to local situations.

Not the least valuable section of the book is the appendix, which is made up of a collection of instruction and job sheets in some seventeen subjects. These illustrate every type of successful sheet now in use in the schools, and suggest many useful devices which instructors can adopt and adapt in developing sheets in their own schools.

Mechanical Drawing

By De Witt Hunt. Cloth, octavo, 184 pages. The Harlow Publishing Company, Oklahoma City, Okla.

This book combines a carefully-graded series of projects in mechanical drawing and an orderly statement of the principles and conventions of the subject as applied to common objects, simple machinery forms, typical geometric forms, and building construction. The work is complete and well adapted for a rather inclusive two-year course in the high school.

Fifty Dollars a Week with Car and Camera

By Paul Glenn Holt. Cloth, 99 pages, illustrated. Price, $1.50, net. Published by R. Snyder, 18 Derne St., Boston, Mass.

This book suggests numerous ways of earning money with a camera by photographing historic houses and other buildings, landscapes, animals, still subjects, etc., etc. Many practical ideas for taking pictures, developing, printing, and selling are included.

Machine Design Problems.

By S. J. Berard and E. O. Waters. Cloth, 118 pages, illustrated. Price, $1.50. Published by D. Van Nostrand Co., New York City.

While this book is intended to supplement the authors' "Elements of Machine Design," it will be found useful in any advanced high-school course in mechanical drawing or in any introductory engineer's drafting course in the junior college. The problems cover practically every element of machine design, and have been apparently taken from the drafting rooms of a variety of manufacturers.

Designing With Wild Flowers

Nettie S. Smith. Cloth, 102 pages. Price, $2.50. Bruce, Milwaukee.

This book is a helpful guide for teachers and students and strikes out into new fields in the design and teaching of art as expressed in the design of wild flowers. Sufficient variety and difficulty have been introduced to carry the student as far as his ability will allow and the training offered will develop taste and ability to recognize quality in good design.

The book is divided into three parts and contains 32 plates. Among the subjects covered are making balanced design units, design applications, batik simplified, color, and adapting photographs for decoration. The second part of the book contains a calendar for the year which is prepared to assist teachers in planning their work for each month, for each season, and for the holidays.

For the student, the book offers examples simple enough for elementary study and problems and suggestions which will carry him as far as he is capable of going. For the busy teacher, it offers such direct applications of the subject as will enable every pupil to produce interesting results. For the professional designer, the book offers a number of plant drawings suitable for his trained hand and mind, together with new devices for working which bring pleasure and skill in producing results.

PUBLICATIONS RECEIVED

Administration of Civilian Vocational Rehabilitation. John A. Kratz and H. B. Cummings. Bulletin No. 113, Rehabilitation Series No. 12, December, 1926. Issued by the Federal Board for Vocational Education, Washington, D. C. This bulletin outlines the policies followed by the Federal Board in interpreting and administering the national civilian vocational rehabilitation law, and supersedes Bulletins No. 57 and No. 77. The pamphlet takes up such

(Concluded on Page 58a)

It's a Treasure Chest of Novel Art Ideas and It's FREE!

DID you get your copy of "NEW ART IDEAS FOR SPRING" - or do you want a second copy?

This always welcomed, illustrated booklet is one of a series which contains a wealth of valuable and out-of-the-ordinary suggestions for all art and handicraft work. You'll find it a veritable "treasure chest."

It gives you the best, most advanced ideas for classroom use, compiled by experts on the subject. The suggestions are divided according to school grades and each one is designed to be within the capabilities of the specified grade and semester.

This booklet will freshen and revitalize your work wonderfully. That it is intensely practical is guaranteed by the fact that it is a product of our nationally known American Art Aid Department, in direct charge of those two dominant leaders in school art development - Pedro J. and John T. Lemos.

The nation-wide demand for this store-house of ideas is so heavy that we have only a limited supply left.

Write today - without obligation, of course.

The
AMERICAN CRAYON COMPANY
NEW YORK DALLAS SAN FRANCISCO

HOME OFFICE AND FACTORIES
382 HAYES AVE. SANDUSKY·OHIO

DAKALITE

DAKALITE IS SPECIFIED

BY

HUNDREDS OF MANUAL ARTS DEPARTMENTS

AND

FURNITURE FACTORIES

Dakalite Durable Dye-Stains are being given unqualified approval by daily use. There are a dozen excellent reasons why Dakalite Dyes give quality results where high grade staining is demanded. The qualities you want in a wood stain, — Permanence, Penetration, Beauty, Convenience, Ease of Manipulation, — all these, and others including low cost are found in Dakalite. Requisition Dakalite now; you will be pleased with our service.

DAKALITE PRODUCTS CO., INC. **Minot, North Dakota**

(Concluded from Page 56a)

phases of the subject as principles of promotion, digest of the national civilian rehabilitation law, interpretation of the provisions of the law, permissible expenditures, reports and records.

How Spoons are Made; Selecting Silver for the Young Bride. Issued by Rogers, Lunt & Bowlen Co., Greenfield, Mass. The first pamphlet offers a brief description of the process of manufacture in spoonmaking. The second pamphlet lists and describes a wide selection of solid silverware in a variety of styles and designs. Both pamphlets are helpful in connection with home-economics classes, in offering a knowledge of the process involved in manufacture and in establishing a guide for the selection of the proper table equipment for the home.

Apprenticeship in the Metal Trades: The Key to Opportunity. By Henry J. Roesch. Price, 25 cents. Issued by the National Metal Trades Association, Chicago Branch, Chicago, Ill. The pamphlet has been prepared for the purpose of providing young men of Chicago and vicinity, parents, and teachers, with information about the opportunities of learning one of the many trades carried on in the shops of the Chicago branch. It emphasizes the need of selecting a trade and of obtaining that training which will afford equipment for earning a livelihood. It lists six different forms of training in the trades and offers a sample schedule of training for the machinist apprentice, the tool-and-die maker, the patternmaker, the foreman, the heat treater, the boilermaker, the sheet-metal worker, the welder, and the draftsman apprentice. The book is most practical and represents a type of vocational guidance material which is very much needed.

Development and Manufacture of Silverware and Correct Table Service. A series of six lectures on silverware for a home-making course. Issued by the Holmes & Edwards Silver Co., Bridgeport, Conn. The pamphlets discuss the development of the table service, the choosing of the silver, and the arrangement of the table service. A glossary of terms applying to silver flatware and hollow-ware is included.

Printing Instruction Charts

Charts Nos. 1 to 24. Cardboard, 11" x 14" in size. Arranged, printed, and distributed under the direction of the Education Department, American Type Founders Company, Jersey City, N. J.

The material presented in these charts is intended to cover in a general way the entire course in printing. The charts are printed on stiff white cardboard and show clearly and distinctly the standard practice in printing.

Chart 1 depicts the layout of the California job case and shows the arrangement and distribution of type. Chart 2 relates to the parts of printing type and shows exactly such as serif, beard, counter, stem, groove, and shoulder. Chart 3 is entitled "Measuring Type With a Line Gauge." Chart 4 is entitled "How to Hold the Composing Stick" and offers an illustration of the stick as it is held in the hand of the operator. Chart 5 is entitled "Testing the Line for Justification" and the illustration shows a line properly justified and able to stand without support other than its own tightness. Chart 6 is entitled "Spaces Used in Setting Type." It gives standard widths of point-set spaces. Chart 7 is entitled "Characters Difficult to Distinguish." Chart 8 is entitled "How to Read Composed Type." Chart 9 is composed of standard proofmarks and shows the application of the proof marks in general use to a typical proof. Chart 10 is entitled "How to Empty a Stickful of Type." Chart 11 is entitled "How to Hold Type for Distribution." Chart 12 is entitled "Lining Type with a Rule," and shows both proper and improper ways of lining with a rule.

Chart 13 shows type faces of type and basic designs which are in general use. Chart 14 is entitled "Different Kinds of Indentions" and shows hanging, diagonal, square, and half diamond indentions.

Chart 15 is entitled "How to Piece Out Short Leads" and shows both the right and wrong ways of piecing out leads. Chart 16 is entitled "How to Set a Stick for Short Measures" and shows how each line is justified against a slug or heavy rule which follows the subsequent columns.

Chart 17 is entitled "The Proper Way to Place Type in the Stick." Chart 18 is entitled "Picking a Line to Replace in the Stick for Correction." Chart 19 is entitled "How to Tie Up a Page of Type." Chart 20 shows how to fasten the page cord, how to fasten it against the corner, and how to draw out the loop in untying the page.

Chart 21 is entitled "Locking Up a Single-Page Form" and illustrates the form after it has been arranged and locked up. Chart 22 shows the lockup of a four-page form.

Chart 23 is entitled "Setting Guides and Fenders" and shows illustrations of feed guides and gauge-pin guides in position. Chart 24 is entitled "Breaking a Form for Color."

The material presented contains very little description but offers a graphic presentation of the fundamental principles of printing so that the student is given a good idea of the nature, content, and scope of printing work.